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AGRICULTURAL ECONOMICS AND SOCIOLOGY

MONTHLY BULLETIN

OF

AGRICULTURAL ECONOMICS AND SOCIOLOGY

THE WORK OF THE FARM ACCOUNTANCY OFFICES AND THE REPRESENTATIVE CHARACTER OF THE RESULTS OF FARM ACCOUNTANCY

by JOSEPH DESLARZES, Ing. Agr.

SUMMARY: *Preface.* — I. *History.* — II. *Quality of material furnished by the accountancy offices.* — III. *Activity of the accountancy offices.* — IV. *Their publications.* — V. *The representative character of the accountancy results furnished by the offices.* — 1. Some remarks concerning the representative method. — 2. Methods of reasoned choice applied by the offices. — 3. Control of the representative character of accountancy results in certain countries. — VI *Conclusions.*

Preface.

The war interrupted the collection, preparation and publication of the results of farm accountancy started by the Bureau of Economic and Social Studies of the I. I. A. in 1929. Since 1929, the results of farm accountancy for a considerable number of countries have been published in the form of annual volumes for the period 1927-28 to 1936-37. The last volume appeared soon after the outbreak of the war, at the beginning of 1940.

In the course of over a decade of work, always in close collaboration with the farm accountancy centres in the countries which communicated their data to the Institute, we have been in a position to make certain observations with regard to the methods adopted in the various countries, as well as in respect of the means which could contribute to render the material more uniform and thus better to adapt it for international comparisons.

We thought it expedient, therefore, at a time when our current work on farm accountancy has been interrupted, to collect and to publish the results of our observations, hoping thus to facilitate the resumption of the work when the war is over, and to explain the difficulties which we had encourtered in the past.

The sources of our material have largely dried up since the outbreak of the war. Accordingly, we draw the reader's attention to the fact that *all that is said in the present article refers entirely to the period preceding the war*, or, more precisely, to the period which closes with the agricultural year 1936-37.

I. — History.

Statistical studies based on the results of farm accountancy began towards the end of the last century. The first accountancy office in Germany was established in 1872 by Howard. During the following decades other similar offices were created by the *German Society of Agriculture*, by the Farmers' Union and by private individuals. Before the outbreak of the 1914-18 war, there were already 30 farm accountancy offices in Germany engaged in analysing the accounts of 3,000 farms, most of which belonged to the category of large farms. The keeping of accounts developped rapidly in the years immediately after the war. As a result of the agricultural depression the farmers came increasingly to realize that accountancy would enable them to make considerable progress towards the economic rationalization of their business; on the other hand, fiscal legislation required the keeping of accounts; lastly, the agricultural organizations were very active in encouraging accountancy, which they considered as the most effective way of helping farmers in their struggle against the difficulties of life. At the present time there are over 300 farm accountancy offices in *Germany* controlling the results obtained on more than 40,000 farms.

In *Switzerland*, the *Secretariat of Swiss Peasants* published the first results of farm accountancy at Brougg in 1901. Their usefulness in connection with the solution of technical farm problems and questions of agrarian policy was quickly realized. Foreign countries soon became interested in the work carried on by the Secretariat of Swiss Peasants in this field, and sent experts to study its organization. Several countries established accountancy offices on the same model as the Brougg office: Denmark, Norway, Sweden, Finland, the State of Baden and Bavaria.

The creation of the first farm accountancy offices in *Denmark* was due to the activity of the Societies for the control of the dairy industry, established in 1895, and also partly to the cooperation of the large farms. The *Control Society of the Midt-Langeland* set up an accountancy system in 1907 on the initiative of its manager, A. C. Duborg. It was not until the spring of 1914 that the Royal Danish Society of Agriculture proposed to create a special farm accountancy office: M. C. H. Larsen, Professor of rural economy at the Royal Veterinary and Agricultural School in Copenhagen, was entrusted with the direction of this office.

In *Norway* in 1907, M. Haakon Five, Professor of Agriculture, collected some information concerning farming conditions in several districts of the eastern region of the country. The results of this first survey were submitted to the *Royal Society for the Well-being of Norway*. In 1909, M. Five was awarded a grant by the Society enabling him to go to Switzerland and study the work done in that country by Prof. Laur in connection with farm accountancy. An accountancy office was established at Oslo in 1911.

In *Sweden*, the establishment of farm accountancy was due, to a certain extent, to the promulgation in 1910 of the law introducing the income tax, as the ascertainment of the net income was required for the assessment of the tax. The

Riksdag has distributed 15,000 crowns annually since 1914 to the rural economy societies and to two accountancy unions. With the aid of this subsidy seven rural economy societies and two accountancy unions have created farm accountancy offices. In 1916, the Swedish General Agricultural Society, which had just been established, created a *Bureau of Farm Management* for the scientific analysis of the data collected by the accountancy offices.

In *Finland*, research in this field was commenced in 1912 by the *Suomen Maatalousseurojen Keskusliitto*. The work of collecting and arranging accountancy results was entrusted in 1915 to the rural economy Section of the Department of Agriculture.

In *Austria*, the first accountancy offices were created in 1908 due to the initiative of the Ministry of Agriculture; there were 12 offices in the country in 1914. The origin of farm accountancy work in *Bohemia and Moravia* also goes back to the period of the Austrian Monarchy. It was M. A. Ostermayer who founded an accountancy office in the German section of the Brno Agricultural Council, but the work of this office was interrupted when M. Ostermayer was recalled to Vienna. In 1913, however, four accountancy Institutes were created at Prague, Brno and Opava. A single central institute was established at Prague in 1917 by M. V. Brdlik.

Immediately after the war accountancy offices were created or developped in *Poland*, *Hungary*, *Lithuania*, *Estonia*, and later in *Romania*, *Scotland* and *Bulgaria*. In *England* the offices (Oxford, Cambridge, Leeds, Bristol, Newport, Wye), are engaged chiefly in the work of cost accountancy.

In the *Netherlands*, the introduction in 1915 of the tax on farm income led to considerable progress in the field of farm accountancy.

In the *United States*, the first farm accountancy office was established in Wisconsin in 1909. Rapid progress has been made since then and in 1923 the Extension Work Office employed 7,000 persons, 2,500 of whom were propaganda agents and 1,055 demonstration agents. The farm accounts summarizing schools numbered 893 and were attended by 24,253 farmers.

Mention may also be made of the work done in the Punjab, *British India*, by Mr. Labh Singh, who has been publishing figures concerning the different types of well-irrigation in the Punjab ever since 1926. His studies were made on some 60 farms in 1935-36. Research work was also carried on in connection with coffee-growing on the experimental station at Balehonnur (Mysore, *British India*), the results of which appeared in *Farm Accountancy Statistics* for 1931-32, while the results obtained on 35 coffee plantations in Kiambu (Kenya) appeared in the volume for 1930-31.

Offices have been established recently in *Palestine* and in *France*. The Union of farm accountancy and statistical offices was founded in Paris in 1937. At its general assembly on December 7, 1938, the Union consisted of 13 offices: Blois (Loir-et-Cher), Crest (Drôme), Etrépagny (Eure), Laon (Aisne), Lille (Nord), Neufchâtel (Aisne), Noyon (Oise), Paris (Ile-de-France), Seine et départements limitrophes, Reims (Marne), Saint-Quentin (Aisne), Soissons (Aisne), Verdun (Meuse). An office was also created at Ghent in *Belgium* in 1937; it is under the direction of M. G. Baptist who supervises results on over 200 farms.

In many countries the idea of farm accountancy has been slowly gaining ground. Mention may be made of the extremely interesting studies carried out by Prof. Tsimaros [1] in Greece, M. Dubic in Jugoslavia [2], by the accountancy offices in Japan and China, with whom we have tried in vain to communicate, the work of M. Rao Bahadur P. C. Patil, published in Bombay in 1933 [3], in which the author refers to the principles introduced by Dr. Laur and gives numerous examples of accountancy results obtained in the Decan, the pamphlet published by Dr. Domingo Bórea [4] in Argentina, and the work done in Italy by Dr. Perini of the Institute of Agrarian Economy, Rome [5], which concerns between two hundred and three hundred farms in various provinces.

We would advise everyone who is interested in the way in which the offices have been established in a very large number of countries, in their organization and methods, to read the monograph concerning accountancy offices published by the Institute in 1924 [6]. Although it requires to be brought up to date and completed, it nevertheless offers the reader much valuable information.

II. — Quality of the material furnished by the accountancy offices.

A large proportion of the offices have adopted Dr. Laur's system; others use methods very similar to those recommended by Prof. Laur and later adopted by the International Congress of Agriculture held ad Bucarest in 1929 and also by the International Institute of Agriculture.

The idea of co-ordinating the activity of the offices in order to make it possible to utilize the results of their work on an international scale, an idea suggested and advocated by Prof. Laur, was formulated officially for the first time by the General Assembly of the International Institute of Agriculture in 1913. It was necessary not only to secure the collaboration of the offices, but also to make an exact definition of the terminology to be adopted, to agree upon the principles to be followed and, lastly, to ensure that the material collected would be presented in such a way as to make the results both uniform and comparable.

As early as 1914 Prof. Laur was studying the technical aspects of the problem, which he described fully in an article entitled " Basis of international Statistics of Agricultural Book-Keeping ", published in the *Monthly Bulletin of agricultural Intelligence and Plant diseases*, N. 2, International Institute of Agriculture.

(1) Recherches agro-économiques et comptabilité agricole. Athens, 1936 (original text in greek).

(2) Prilog Istraživanju seljačtoga gospodarstva, Krizevci, 1933.

(3) Principles and practice of farm costing with studies, Bombay, 1933.

(4) Contabilidad rural, Buenos-Ayres, 1937.

(5) Risultati economici di aziende agrarie negli anni 1929-1936, Rome.

(6) Les offices de comptabilité agricole dans les divers pays, Institut international d'Agriculture, Rome, 1924.

The outbreak of war a few months after the publication of the article referred to above, prevented any action being taken in connection with Prof. Laur's plans. But in 1924 an article by the same author, entitled " The organization of international Statistics based on the results of researches carried out with the assistance of agricultural Book-Keeping ", was published in N. 3 of the *International Review of the Bureau of agricultural Intelligence and Plant deseases.* He suggested that results should be grouped according to farming methods and size groups: this principle has been adopted in carrying-out subsequent work and in the preparation in 1926, with the collaboration of several experts from the countries interested in the subject, of a questionnaire for the collection of statistics. This survey, the first ever undertaken in this field, failed, for several reasons, to give satisfactory results.

The subject was discussed in a much more concrete form in November, 1927, on the occasion of the meeting of the Commission for rural economy and also at the first session of the Sub-Commission for farm accountancy.

A final draft was prepared at the meeting of the Sub-Commission for farm accountancy when the IX General Assembly was held in 1928; this draft was based on reports presented by the Bureau of Economic and Social Studies of the International Institute of Agriculture. The Sub-Commission approved them, together with the draft of the report to be presented in 1929 by Prof. Laur at the International Congress of Agriculture, at Bucarest. This last-mentioned report contained definitions of the principal terms used in farm accountancy and established the methods to be used in calculating results. The Bucarest Congress also adopted the suggestions made by Prof. Laur.

The International Institute of Agriculture started immediately to carry out the task with which it had been entrusted. In order to study the organization of the offices and the methods employed, to collect statistics and establish permanent contact with the Offices, in 1929 the Institute appointed two members of its technical staff to visit the farm accountancy offices in 18 countries. The Offices readily gave the two experts all the information requested concerning their organization and methods. The first number of *Farm Accountancy Statistics*, was published in 1931. Sixteen countries were represented in this publications, the figures referring to the agricultural year 1927-28.

Number and area of farms.

The number of farms concerning which the results have been utilized by the International Institute of Agriculture has increased from year to year. In 1931 the number of farms concerning which results were published in *Farm Accountancy Statistics* for 1927-28 totalled 8,791, covering an area of 624,045 hectares; eight years later, *Farm Accountancy Statistics* for 1935-36 included 25,028 farms covering an area of 1,764,226 hectares. From 16, the number of countries had increased to 22 (Table I).

TABLE I. — *Number and area of farms concerning which results are published in Farm Accountancy Statistics.*

Country	Number		Area	
	1927-28	1935-36	1927-28	1935-36
Denmark	726	813	31,726.20	31,327.30
Netherlands (Overijssel)	1,987	6,454	60,174.47	152,531.11
Switzerland	500	576	7,150 —	8,145 —
Germany	2,298	9,358	300,595.95	975,967 —
Austria	397	—	9,791.92	—
Hungary	186	359	119,340.84	128,071.50
Romania	63	317	1,830.90	3,860.86
Czechoslovakia	247	706	6,480.75	16,017 —
Poland	804	690	10,967.59	8,127.26
Lithuania	—	50	—	2,793 —
Latvia	117	168	5,331.69	6,632.64
Esthonia	250	300	10,460 —	11,124 —
Finland	489	960	14,414.76	26,920.64
Sweden	390	537	24,014.08	34,709 —
Norway	190	202	3,279.40	3,147.76
England	146	71	18,361.60	6,535.35
Scotland	—	287	—	34,931.08
Ireland	—	11	—	310.75
France	1	130	125 —	37,700 —
Italy	—	81	—	8,206 —
United States of America	—	2,939	—	261,659.17
Palestine	—	19	—	5,510 —
Totals	8,791	25,028	624,045.15	1,764,226.42

Grouping of farms.

The farms were grouped according to farming methods, region and size. This grouping was, however, far from being uniform, as may be seen from the following little table:

A) *Countries in which the offices group the farms according to farming methods*: Austria, United States of America (Illinois, Michigan, Indiana).

B) *Countries in which the offices group the farms according to both farming methods and region*: Netherlands, Scotland, Romania.

C) *Countries in which the offices group the farms according to farming methods, region and size*: Germany, Sweden, Czechoslovakia.

D) *Countries where the offices group the farms according to farming methods on the one hand and to size on the other*: Switzerland.

E) *Countries where the offices group the farms according to region on the one hand and to size on the other*: Poland, Finland, Latvia, Estonia.

F) *Countries where the offices group the farms according to size*: Denmark, Lithuania, Hungary.

G) *Countries where the offices group the farms according to region*: United States of America, Norway.

It would be highly desirable, if possible, to achieve more uniformity, but under present farming conditions this would appear almost impossible of realization. Indeed, even supposing that the war should leave matters as they were, account must be taken of the fact that these conditions vary widely from one country to the other. Hungary, for instance, is a country in which there still exist large estates (over 2,000 hectares), and where grouping according to size is imperative, while in Estonia, Latvia and Lithuania, where the average size of farms since the agrarian reform has been between 30 and 40 hectares, this classification is of less importance than is grouping according to region. In Denmark, it is more convenient to group farms according to size, because they are highly commercialized and almost all dedicated to dairying, whereas the differences from the standpoint of soil and climate are of but slight importance. In Sweden, on the other hand, grouping by region is extremely important; as regards cereals, the farms in Norrland produce only a little rye and barley, while in the Centre one finds even sugar beet: in the South they give a very high yield; hence the grouping of farms according to region, farming methods and size. Grouping of farms is therefore dependent on climate, soil, the land system, the systems of farming, and on other factors; consequently, it would never be possible to obtain absolute uniformity. The offices should nevertheless attempt to come to some agreement and standardize their methods in so far as possible. This would be of great assistance in comparing results.

Forests.

It is of extreme importance to solve the problem as to whether forests should be considered as belonging to a farm. A farm constitutes an organic whole. Forestry is only a branch of farming in so far as the forest, by giving work to the staff and to draught animals, brings in accessory income and supplies the farm with a reserve. But as soon as the forest acquires considerable importance, it is advisable to separate forestry from agriculture. Difficulties arise when an attempt is made to apply this principle to the calculation of the results per hectare. Some offices use the total area, including forests, others adopt the cultivated area as a basis, still others the arable area. Five classes may be distinguished in this respect:

A) *Countries in which the offices use the total area, including forests and uncultivated area*: Romania, Michigan, Indiana (U. S.).

B) *Country where the office uses the cultivated area, including water and forest*: Poland.

C) *Countries where the offices use the cultivated area, including forests*: Switzerland, Austria, Latvia, Estonia, Finland.

D) *Countries where the offices use the cultivated area*: Denmark, the Netherlands, Germany, Hungary, Czechoslovakia, Lithuania, Norway, Scotland, England, France, Italy, Illinois (U. S. A.), Palestine.

E) *Country where the office uses arable area*: Sweden.

It seems to us that the offices could find a solution better adapted to the purpose for which they are working and to the fundamental principles described above; they might choose, for instance, the cultivated area, which has been adopted by the majority of countries. As they stand, the tables published in Farm Accountancy Statistics, nevertheless, make it possible to form an idea of the influence of forest areas on the results and approximately to estimate the difference which would result from all the offices including forests among the branches of farming.

Capital.

The table of capital invested in agriculture has some regrettable gaps: (*a*) Denmark, Norway, Sweden, Hungary, Scotland, England, Italy, France, and the United States give no indication making it possible to calculate the amount of farm debts and capital on the farms; (*b*) the German offices do not calculate the value of land capital, the French office at Soissons does not give any indication of the value of buildings, the circulating capital or the farm debts.

It is unfortunate that there should be no information available concerning land values in Germany; an estimate can in no way replace exact figures. In the case of Germany, it is thus impossible to calculate the profit or loss on total farm assets, by means of which a comparison may be made between the interest on capital invested in the farm and what the same capital would have brought in if invested in some other enterprise at the usual rate of interest. Expressed as a percentage of the gross return, it shows the alteration which would have had to be made in the average prices of agricultural products to allow the gross return to cover the costs of production. The special interest attaching to profit (or loss) on total farm assets consists in the unique contribution it gives to the price policy and to agricultural policy as a whole.

In the economy of a country at the present time the formation of prices is extraordinarily complicated by the fact that the value of money is subject to fluctuations and that prices react upon each other. The lowest limit of prices is fixed by the expenses involved by agents foreign to the farm. These expenses are calculated by subtracting the earnings of the head of the undertaking from the cost of production of which they form a part; these earnings consist of a normal salary plus a normal interest on the capital belonging to the head of the business. If the sum required by the head of the business to ensure his livelihood is added to the expenses involved by agents foreign to the farm, we obtain what Dr. Laur calls the *existence minimum* (1).

« The producer who has other sources of income may for a certain period, observes Dr. Laur (2), deliver a part of his produce at a price below the limit fixed by the existence minimum and even by the expenses incurred for agents foreign

(1) LAUR, « Volkswirtschaftliche Grundlagen der Wirtschaftslehre des Landbaues », Aarau, 1936.
(2) LAUR, op. cit.

to the farm. But if this state of affairs were to be prolonged, ruin would follow in a short time. In reality, the producer cannot be content with the prices which barely allow him to cover these expenses; he demands that his work should be remunerated at the same rate as that of his workers and that the capital he has invested in his business bring in the same interest as it would have done if invested in a bank at the usual rate. For him it is therefore the cost of production which must enable him to fix the lowest limit of prices. He will use, as has just been said, the profit (or loss) on total farm assets measured in relation to the gross return ».

Gross return.

Let us now consider *gross return* (1). Most countries have adopted Prof. Laur's method: the results for these countries are perfectly comparable. The countries which depart most widely from this method are the following:

(*a*) the *Netherlands:* With the exception of the Overijssel office, the offices in the Netherlands give the total gross return only, without any indica-

(1) In order not to encumber the text, definitions of the farm accountancy terms appearing in this article are given below.

At the suggestion of Prof. Laur the following terminology has been adopted for international statistics concerning farm accountancy results (For details see INTERNATIONAL INSTITUTE OF AGRICULTURE, "Farm Accountancy Statistics" for 1936-37 and previous years. – Prof. Dr. E. LAUR, "Terminology and bases for an international agricultural Statistic founded upon farm accounting", 1929, Brougg):

(*a*) *Gross return* means the total increase of value obtained in one year on the farm through transformation, exchange and revaluation. It therefore includes: cash receipts and accounts from the sale of farm products; the value of contributions in kind from the farm (including the rental value of farm dwellings) to the household, subsidiary undertakings and those covering payments to salaried employees; value of the produces of the farm transformed into permanent improvements or repairs on the farm itself (*e. g.*, wood for buildings or implements, in so far as forests have been considered as belonging to the agricultural undertaking); increase of supplies and of the live and dead stock.

b) By *farm expenses* are meant the total amount of sacrifices of every kind made in order to obtain the gross return, with the exception of a charge for interest on the whole assets (If the interest service on whole assets is added to farm expenses, the *cost of production* is obtained). By subtracting labour costs (wages to employees, a fair wage claim for unpaid labour of family) and taxes from farm expenses, the result obtained represents operating expenses. Consequently, farm expenses include outlay for hired labour (cash wages, bord contributions in kind from the farm, insurance, etc.); a fair wage claim for unpaid labour of the operator and the members of his family on the farm; other cash payments for current expenses on the farm; other contributions in kind made by the operator to cover farm expenses; decreases of supplies and of the live and dead stock, and depreciation charges.

(*c*) *Net return* is the interest effectively earned on the whole assets invested in the farm. It can be calculated by subtracting farm expenses from the gross return.

(*d*) By deducting the interest paid on debts from the net return, *return on own capital* is obtained (capital belonging entirely to the operator, and consequently less any capital he may have borrowed).

(*e*) By adding to return on own capital the fair wage claim for members of the operator's family (not paid but entered in the accounts) we have the *operator's family farm* earnings. This value will repres-

tion concerning the composition of the different items. In this total increase in farm supplies, cultivation expenses made in improving land fertility value of farm products assigned to workers as wages in kind, contributions in kind from the farm to the household and to subsidiary undertakings, and renting of buildings are not included.

(*b*) *United States:* The Illinois, Michigan and Indiana offices do not show contributions in kind to the household as part of the gross return; in the annual publications of the Bureau of Agricultural Economics containing the accountancy results for all the regions of the United States, contributions in kind from the farm to the household are not distributed among the various items of the gross return, but are included under the heading " other products".

(*c*) *Germany*: The consumption of the private family and wages in kind are not distributed among the various items of gross return, but are shown under the heading " other products ".

Cost of Production.

In calculating the *cost of production,* not all the offices have adopted Prof. Laur's method. We have seen (see note (1), page 235) that farm expenses mean the sum of outlay and expenses: seeds, fertilizers, fodder, expenses for upkeep of material and installations, repairs, depreciation, care given to animals, heating, electricity, other general expenses, advances on crops, decreases in inventory; taxes and insurance, with the exception of personal charges, labour expenses.

ent the fraction of gross return actually received as remuneration for own capital and labour expended by the operator and the members of his family.

(*f*) The *social income* consists of the net total increase of value obtained by the operation of the farm. It includes therefore, besides the net return, a fair wage claim for the unpaid labour of the operator and his family on the farm, wages in cash and in kind paid to workers and employees and taxes paid on the farm. In other words, if net return is divided into return on own capital and—if there are payments to be made for rents or for covering interest service on debts—on outside capital, the social income consists of the operator's family farm earnings, salaries and wages, payments to the landlord and creditors, rates and taxes due to the Government, communes, etc., which are included in farm expenses. It is, therefore, possible to make a direct calculation of social income by deducting operating expenses from gross return.

(*g*) Another very important value is *profit* (*or loss*) *on total farm assets*, mentioned above when discussing capital. It is calculated by subtracting production costs from gross return.

(*h*) *Labour earnings* can be found by subtracting interest service on the operator's own capital from the family farm earnings.

(*i*) In order to find the *operator's profit* (*or loss*), a fair wage claim for the work of the family and a fair interest service on own capital should be subtracted from the family farm earnings.

(*j*) Lastly, *interest return on landlord's capital* is found by subtracting the interest service on the tenant's capital from the net return on total farm assets; *interest return on the land alone* is obtained by subtracting the interest service on tenant's capital, building capital, plant capital and improvement capital from the net return on total farm assets; and the *yield* (*or return*) *value* on the farm by capitalizing net return on total farm assets at the usual rate.

This last item includes the cost of manual labour supplied by the operator and his family; this labour is estimated at the same rate as that of the hired workers, with the addition of an indemnity for management, corresponding to that which would be paid to a manager. We have also seen that if interest on capital invested in the farm is added to farm expenses, the result obtained constitutes the cost of production. All the offices do not keep strictly to this method. The following are the most important differences registered:

(*a*) LABOUR EXPENSES: *Soissons* (*France*): the work of members of the farm operator's family is included with that of the hired workers. *Italy:* the fair wage claim for members of the family is not included in the accounts. *United States:* unpaid wage claims are shown under the heading " family labour ".

(*b*) SEEDS FERTILIZERS, FODDER: *The Netherlands* (not including Overijssel): farmer's outlay for seeds, fertilizers and fodder are not included in the accounts.

(*c*) TAXES: *Sweden:* Taxes and depreciation are not always shown separately from other working expenses.

(*d*) DEPRECIATION: *Denmark, Scotland, United States:* Depreciation is shown as a whole or in part among other expenses.

(*e*) INTEREST ON CAPITAL: *Scotland, Ireland, the Netherlands:* interest on the land capital is replaced by rents paid. *Germany:* interest on capital is not shown, so that it is not possible to calculate profit or loss on total farm assets.

Owing to these differences, the net return, or total result obtained by deducting farm expenses (see note (1), page 235) from gross return, will not always be exactly the surplus realized in the course of an agricultural year by a farm considered as being without debts, between the gross return on crops and animal husbandry and the expenses incurred by operation and the replacement of investments made at the outset. In extreme cases (Netherlands, not including Overijssel) we have a kind of free income; in Ireland and England, we have the net taxable income.

Net return on total farm assets.

We know that the *net return* is the amount of the sums remaining available to the farmer which may be used without disturbing the operation of the farm. It must not be confused with the *family farm earnings*, which indicate the farmer's situation: they represent the sum which the farmer may spend to cover his own and his family's needs without touching his capital (see note (1), page 235). We have seen (see note (1), page 235) that in order to calculate farm earnings, interest on debts must be deducted from net return while the value of a fair wage claim for the labour of the farmer and his family must be added to the amount. The majority of countries have adopted this method, Denmark, Norway, Sweden, the Soissons (France) office, and Italy consider that the farm is free of debt and do not deduct interest service on debts from the net return.

Labour earnings (see definition, note [1], page 235) may be compared with the fair wage claim of the family, to see whether the earnings of the latter are greater or less than the family is entitled to. Labour earnings may also be calculated per man-day and compared with to the cost of a labourer's working day. It would be an improvement if the offices were to give information concerning labour earnings per hectare and per man-day, or at least if they would calculate all the labour earnings per hectare or per man-day. Unfortunately this is not the case. In this respect, the countries fall into two groups:

Countries where the offices calculate labour earnings.

a) *Per man-day*	b) *Per hectare*
Switzerland	Denmark
Austria	Sweden
Overijssel (Netherlands)	Norway
Czechoslovakia	Finland
Poland	Latvia
Lithuania	Wurtemberg (Germany)
Estonia	Scotland
	Romania
	Illinois, Michigan, Indiana — U. S. A.

Germany, Hungary, the Soissons (France) office, Italy, the Netherlands (not including Overijssel), give no indications concerning labour earnings.

Information concerning labour is lacking in the case of the following countries: Germany, Sweden, Hungary, Romania, the Netherlands (not including Overijssel), Italy, Soissons (France), United States (except Michigan and Indiana).

Social Income.

We have still to discuss *social income* which includes (see note [1], page 235), all farm incomes: net return, taxes, total cost of labour. The net return, as has been seen, has two uses. In so far as it is the return on family capital, it serves to form family farm earnings, and in so far as it is interest on debts it serves to pay the interests to the creditors.

The social income consists therefore of the contractual and non-contractual income, the former consisting in its turn of wages to employees, of interest on debts and of taxes, and the latter, of family capital return and of the fair wage claim of the operator's family. The laws governing the former are similar to those determining prices. An increasing demand for labour and capital causes a fall in wages and interest rates; a decreasing demand causes them to rise. Non-contractual income can only be measured by means of accountancy results. The most profitable farms attract operators and capital. Their power of adapting themselves to market fluctuations is very variable. The social income of a farm

is that part of the gross return which serves to compensate all the persons who, by their work or with their capital, have rendered services to the farm in question. The sum of the social incomes of all the farms which are connected more or less directly one with the other, forms the income of social economy. The most efficacious way of preventing economic depressions consists in a fair distribution of social income among the needs of consumption, on the one hand, and the investment of capital, on the other hand [1].

Of all the values contained in the table of final results, the social income, with the exception of the differences observed in the composition of gross return and farm expenses, is that which is best suited to international comparisons, as all the offices calculate it or supply figures by which it may be calculated. The Swedish office is the only one employing a slightly different method; it does not show taxes in the social income when calculating averages according to the systems of farming, but only when determining these averages according to regions.

Owing to lack of space, we have not shown the operator's profit or loss, interest return on the land alone, and the yield (or return) value (*valeur de rendement*) on farms in our Farm Accountancy Statistics (see Note [1], page 235). The other figures contained in the tables make it possible to calculate these values. The yield (or return) value is indispensable for assessing estates [2].

It is to be hoped that the offices of those countries where the use of farm accountancy is widespread, or is now gaining ground and will eventually spread, will delay no longer in adopting a uniform method and in supplying increasingly complete material for international comparison.

III. — Activity of the farm accountancy offices.

Importance of the offices.

The need for farm accountancy became particularly obvious when, as a result of technical, economic and social transformations the farm was converted to a certain extent into a commercialized undertaking. The objectives of the accountancy offices are indeed " to obtain from statistics and documentation combined all useful information and to make it available to farmers on the one hand, in

(1) LAUR, op. cit.

(2) See M. G. COSTANZO: " The overindebtedness of farms and the means for its prevention and control ". *Monthly Bulletin of Agricultural Economics and Sociology*, May, 1942, No. 5, International Institute of Agriculture. Absolute overindebtedness, says Mr. G. Costanzo (p. 146), is often incurred in the act of the purchase of the holding. This generally occurs in those cases in which the purchaser does not realize the relation existing between farm income and costs, and therefore pays more for the farm than it is worth, without disposing of sufficient means of his own to make the purchase. Subsequently, on page 154, discussing the measures adopted in the different countries for the control of overindebtedness, the author describes the methods adopted in Switzerland for calculating the assessment value of farms, a value which is based on the yield (or return) value.

order to encourage an improvement in their methods, and to the agricultural profession, on the other, in order to co-operate in its protection ". In order to attain these ends, it is perfectly evident that the offices must place themselves at the disposal of the farmers in order to provide those who defend their interests with a sound basis upon which to build with security. Their only purpose is to serve the truth by defining in exact terms the situation of agriculture and the repercussion on this situation of all technical, economic and social reforms. No one now can ignore the importance and the future prospects of accountancy offices. At a time of economic and social transformations, such as the period through which we are at present passing, transformations involving alterations of a technical character especially on the large farms, those who are called upon to control agriculture as well as the farmers themselves have great need of a guide such as is provided by the work of the accountancy offices. The comparative situation of large and small scale cultivation; improvement of cultivation methods and adaptation to each farm of the means of production; advantanges and disadvantages of motorization on the large farms; importance and distribution of the farm's social income among owner farmers, workers and the State; receipts required by the farms in order to obtain this social income, all these are problems which face the accountancy offices and which must be solved [1].

Above all, the offices wish to assist the peasant who keeps his accounts, the agricultural profession as a whole and the nation. The peasant who keeps his account books acquires a large amount of knowledge which is of the greatest use to him in managing his undertaking; he becomes familiar with certain notions of which he had formerly but a very vague idea: net return, family farm earnings, labour earnings, etc. To have a clear vision of his affairs, to know his farm better, to measure all its productive possibilities, to control his expenses more rationally, to make better use of labour, these are the principal advantages accruing to the farmer from a continued practice of farm accountancy.

Utility of accountancy results in solving economic and social problems.

Moreover, assessment offices make constant use of accountancy results, using in practice the information furnished by practice itself and warning farmers against the purchase of farm holdings at exaggerated prices. The agricultural schools use them in teaching rural economy. Economists find their work considerably helped by farm accountancy results. If these results were not available, economists would be obliged to found their work on mere hypotheses or estimates, instead of on concrete facts. The work of the accountancy offices also makes it possible to achieve a fair solution of the question of agricultural taxation: in some countries, indeed, actual profits are used as a basis for assessing taxation. Based solely on facts and not on estimates, the work of the offices shows the situation of agriculture as it actually is, and consequently this work is of value not to agriculture alone, but also to the whole economy of the nation.

[1] ANDRÉ ROUILLY: « Les comptes à la ferme », *L'agriculture pratique*, Nº 1, Paris, January 2, 1937.

"It suffices, indeed, to group the accounts of a large number of farmers, to study them as a whole and to compare them, in order to multiply the information which each of the participants may draw from the figures and at the same time enrich the whole profession and the nation itself with a documentation of indisputable value whose uses may offer almost boundless scope for development in the most widely differing fields of economy and agricultural policy. Thanks to this pooling of individual experience, it will be possible to obtain at one and the same time an improvement in private economy, progress in the science of rural economy and the most reliable documentary basis for the characterization of agricultural regions as well as a means for guiding the nation's economy. The conjectures of rural economy, based simultaneously on extensive information obtained from accountancy and on general statistics, surveys, monographs, etc., will inspire much greater confidence.

"In national economy, how would it be possible, with means other than accountancy, to obtain such a clear and accurate idea of the agricultural situation in its various branches, and to realize with equal certainty the eventual advisability and efficacy of economic and political measures adapted as a remedy for the difficulties encountered?

"Lastly, accountancy statistics throw much light on social problems concerning wages, distribution of social income, the land system, rents, crop-sharing, family allowances, taxes, etc." [1].

Without the information supplied by farm accountancy, it is extremely difficult, if not impossible, to determine the distribution of national income and to calculate the farmer's share in this income. This is the conclusion at which Dr. H. Böker arrives in his article recently published in the *Monthly Bulletin of Agricultural Economics and Sociology* [2]. "O. C. Stine of the Bureau of Agricultural Economics (United States Department of Agriculture) has also asked himself this question, after having carefully analysed the difficulties and reviewed the gaps in the comparisons of income parity in the United States. As a result, O. C. Stine raises the question whether it would not be better, instead of using total figures, to approach the problem by starting from a certain number of sample farms, by means of yearly income surveys among representative agricultural producers and, for the purpose of comparison, among representatives of other large occupational groups. It seems to us that, as a matter of fact, only by starting from the isolated farm, as suggested by Stine, and not from agriculture as a whole, would it be possible to obtain a more satisfactory answer to the problem of income in agriculture. Farm accountancy has now passed far beyond the stage when too much stress was laid on the net return as the only sign of success. As farm accountancy results began increasingly to be utilized not only for the purposes of private economy, but also for those of national economy, a growing need was

(1) JEAN FERTÉ: «La comptabilité agricole en France», Paris, 1939.

(2) Dr. H. BÖKER: "Agriculture's share in the national income and the agricultural situation", *Monthly Bulletin if Agricultural Economics and Sociology*, January, 1941, International Institute of Agriculture, Rome.

of a standard by which to measure the total return obtained from the farm by all parties concerned. This standard was found in the social income 'from the farm'.

Lastly and above all, the services farm accountancy renders to governments by illustrating the agricultural situation must not be overlooked. On the other hand, in the farm accountancy figures we see the results obtained by the intervention of the authorities in favour of the farmer.

Present and future activity of the offices.

It is to be hoped that after the war offices will be created in those countries which up to the present have not felt the need for farm accountancy and that the documentation obtained from farm accountancy will pay an increasingly important part in our studies and in the work of farmers in general. Mr. Jean Ferté, the untiring advocate of farm accountancy in the Soissons region, once told us how much interest had been aroused among his neighbours by the results of farm accountancy, the spirit of emulation animating the farmers of the district who kept accounts and the rapidity with which the number of these farmers increased. Those who have checked up the account books kept by intelligent farmers over a series of years, know how many improvements have been made in their methods of farming as a result of these records and how quickly they learn to avoid former mistakes and to eliminate useless expenditure. Continuous contact is created between the offices and the farmers, to the great advantage of both.

Space does not permit of a lengthy description of the relations thus established; they differ according to the offices and the countries, and in many cases we know nothing of them, as no further collaboration would be possible between offices and farmers, if the offices made known the names of their collaborators and the characteristics of their farms. The offices publish only the statistics obtained from farm accounts; these statistics contain only the results obtained from farms grouped according to size, farming methods, region, etc. In some countries (Denmark), farmers send in weekly reports on their work to the office or to some special official, these reports enabling those who receive them to keep records; in other countries (United States), farmers periodically send in extracts of their accounts to the offices: the extracts are filled in on special forms prepared by the agricultural colleges, experimental stations, etc. In other countries, again (Switzerland), the farmer takes the whole responsibility for the keeping of his books which he sends in to the office at the end of each year for checking and correction of mistaken entries; the office clears up any doubtful points by correspondence, corrects errors in calculation and lastly closes the accounts. The books are returned to the farmer concerned, with an extract of the essential results enabling him to protect himself if necessary from excessive taxation, and with pratical advice concerning the way to improve his farming methods, if necessary (1).

(1) In this connection reference may be made to the Institute's publication entitled « Les Offices de comptabilité agricole dans les divers pays », Rome, 1924.

This uninterrupted contact between the offices and farmers is of essential importance, but it forms only a part of work of the offices. Indeed, in the course of their research work, these latter must make use, year in year out, of the results obtained. They are in a position to establish statistics and averages enabling them, while scrupulously respecting the confidential nature of private accounts, to make available to their clients and to the profession as a whole, profound and instructive studies concerning the average results obtained, the general characteristics of a whole region, the source of results, causes of success or of failure, etc. The utilization of the documentation they have collected must not be limited to them alone, they must make it known, and this extremely delicate and important matter, which may be called the crowning of the work, calls for initiative on the part of the professional bodies responsible for the general control of agricultural policy [1] *It cannot be repeated too often that the essential interest of accountancy lies in the invaluable assistance which it gives in the control of prices and in every branch of agricultural policy.*

IV. — Works published by the offices.

How do the offices accomplish their task? By establishing constant contacts with the other professional bodies entrusted with statistical studies other than those based upon accountancy, by collaborating with the Government, by obtaining representation in the international field and, lastly, by publishing the results of their work annually.

Most of the offices existing at the present time publish the results of their researches. These publications are extremely valuable because they contain, besides the tables of results, summaries and observations containing detailed information concerning the condition of agriculture in their respective countries, the cause of the variations in accountancy results. Generally speaking, in the introduction they contain information concerning the general situation of agriculture during the year for which accountancy results are given, crops, animal production, prices of agricultural products, exports of agricultural products, and detailed information showing accountancy results, with a more or less extensive commentary concerning the figures in each table, comparisons with figures for the previous year and, lastly, conclusions.

In *Switzerland*, the Swiss Peasant Secretariat (Brougg), follows these considerations with a study concerning the influence of farming systems and size of farms on the results. It gives the characteristic features of the farms which have given satisfactory or unsatisfactory results, making them stand out conspicuously from the average, and lastly graphs enabling the student to follow the progress of the profitableness of Swiss farms since 1901.

In *Denmark, Norway, Sweden* and *Finland*, besides the tables showing averages for size groups and average results for each region or for each farming sys-

[1] M. JEAN FERTÉ: « La comptabilité agricole en France », Paris, 1939.

tem, the publications of the offices contain the individual results of all the farms which kept record. In the publication issued by the Copenhagen office under the title: "*Undersögelser over Landbrugets Driftsforhold*", there is also a study concerning the influence of various factors on results, with illustrative examples and calculations, in each branch of animal husbandry, the net product per fodder unit and, in connection with field products, cost of production per kilogram of product harvested. Lastly, this publication contains information concerning the composition of receipts and expenses, as well as the situation of the farmers' capital.

In the publication issued by the Swedish office: "*Räkenskapsresultat från svenska jordbruk*", the farms are first grouped according to geographical regions and size, and then according to results. A study is also made of the influence of certain factors on the success of the business and the prices realized by the principal products are also calculated.

In *Estonia*, the "*Eesti põllumajanduse tasuvus*", published by the Tallinn office, contained, besides the results of single entry book-keeping, information concerning the quantity and value of products consumed by an adult person, the number of normal days of alimentation, labour conditions on the farms, cost of production of agricultural products, cost of draught by horses and, lastly, the value of fodder transformed into milk.

In *Latvia*, the publication issued by the Riga office: "*Lauksaimniecības rentabilitate*" consisted of a general and a special part. In the first part were found all the accountancy figures included in the Farm Accountancy Statistics and in the second a detailed study of production, returns and expenses for each branch of farming.

Mention may also be made of the publication of the Warsaw office: "*Badania nad opłacalnością gospodarstw włościańskich*" and that issued by the Budapest office: "*Mezögazdaságunk üsemi eredményei*", containing very detailed information concerning the agricultural situation in *Poland* and *Hungary*, with ample commentaries on the results. The Ministry of Agriculture and Land in Bulgaria issued in 1940 a publication under the title "*Rendements de l'agriculture bulgare*", containing accountancy results for 1936-37, 1937-38 and 1938-39. Let us hope that in spite of the difficulty of the period through which we are passing, other volumes will be issued to complete the series commenced. For the past two years, Prof. G. Baptist has issued a publication at Ghent in *Belgium* containing farm accountancy results in Flanders. The last issue contained results from 231 farms. The second part of the publication contains a review of the market situation for agricultural products and information concerning prices.

In the *Netherlands*, the periodical publication of the department of agriculture gave yearly farm accountancy results, grouped according to regions. Unfortunately, the tables did not show the composition of gross return; they only gave the total gross return and the different items of production costs. Even so, the figures for gross return and production costs did not contain certain items, such as increases in supplies and farmers' expenses, so that it was impossible to speak of net return, but only of a kind of free income.

It is unfortunate that in *Germany* the *Reichsnährstand* does not issue a yearly publication containing accountancy results such as those published by the offices

referred to above. Mention should, however, be made of the reports dealing with a series of years, formerly issued by the *German Council of Agriculture* (*Deutscher Landwirtschaftsrat*) (1) and to the regular annual publications of a large number of regional offices.

The Edinburgh office, attached to the Board of Agriculture, *Scotland*, groups the farms according to farming systems and regions; for each group thus formed it gives the general characteristics; passes in review the accountancy results, indicating, for each group, the reason of changes in these results. After showing, for each group, the distribution of area, quantities harvested, head of livestock, composition of labour, evaluation of live and dead stock, the report proceeds to give the financial results obtained on the farm. Next we are given the quantities produced (increase in live stock, quantities harvested) and the prices realized for each group of farms; the report ends with a comparison of results with those of the previous year.

In *England*, the Oxford, Cambridge, Leeds, Bristol, Newport and Wye offices have paid most attention so far to the costs of production in agriculture, and have so far not collaborated regularly with the International Institute of Agriculture.

In the *United States* the accountancy offices are very active. The Bureau of Agricultural Economics in Washington, collects the material assembled by the regional offices and includes it in two recapitulatory tables compiled according to regions and published yearly; here may be found the essential results of farm accountancy. As in the case of Scotland, a slight and simple correction must be made in the gross return and farm expenses as shown by this office, if one wishes to make the figures correspond with those resulting from the use of Dr. Laur's method; from the item: sale of animals, shown in the gross return, should be deducted the expenses for purchase of animals included in farm expenses, because only the increase in value of livestock obtained by the very simple operation described above should figure in the gross return, while production costs are freed of an item which should appear therein.

The offices of the States of Indiana, Michigan, Illinois, Iowa, and others publish yearly pamphlets with a study of results presented clearly and concisely in tables. Some of these offices, such as the one in Michigan, for instance, publish yearly studies concerning the factors to which success in certain branches of agri-

(1) Mention may be made of the publications issued by the Enquête-Ausschuss: « *Landwirtschaftliche Betriebsergebnisse, Untersuchung zur Lage der Landwirtschaft, Auswertung der Buchführungsergebnisse* », Berlin; by the Deutscher Landwirtschaftsrat: « *Betriebsergebnisse der deutschen Landwirtschaft in den Wirtschaftsjahren* 1924/1925-1927/28 », Berlin, 1929, « *Fünfjährige Buchführungsergebnisse der deutschen Landwirtschaft in den Wirtschaftsjahren* 1924/25-1928/29 », Berlin, 1930; by Dr. H. L. Fensch: « *Die Entwicklung der landwirtschaftlichen Betriebsergebnisse seit der Neugestaltung der Währung*, Berlin, 1933, *Siebenjährige Buchführungsergebnisse aus den Wirtschaftsjahren* 1924/25-1030/31 », Berlin 1932, « *Rohertrag und Reinertrag* », Berlin, 1931, « *Das volkswirtschaftliche Einkommen aus der Landwirtschaft* », Berlin, 1935; and, lastly, by Dr. H. L. Fensch and de K. Padberg: « *Zahlen und Bilder aus dem Landbau, bearbeitet auf Grund zehnjähriger Buchführungsunterlagen* », Berlin, 1936, « *Eigenverbrauch und Marktleistung der deutschen Landwirtschaft* », Berlin, 1937.

culture is due: dairying, animal husbandry, poultry rearing, crops in general, fruit, etc., and concerning the cost of production of potatoes peas and other pulse, fat sheep, apples, costs of operation of tractors, etc. Studies are also published concerning market gardening and other special crops.

We know that in other countries, such as China, Japan, and even in the U. S. S. R., there are more or less well-developped accountancy offices. The book which M. Otsuki, professor at the Institute of Economic Research, Imperial University of Kyoto, Japan, has been kind enough to send us (1), describes the methods adopted in Japan, but we have not yet been successful in getting into touch with these offices. We hope to be able to do after the war.

Te need for establishing accoutancy offices everywhere after the war.

We also hope to see, on the morrow of the war, an extension of farm accountancy offices to all the countries of the world. Without desiring to recapitulate once more the ever-increasing advantages that farm accountancy is destined to offer to the farmers themselves, to peasant organizations, and to the community in general, we would recall that farmers will have an increasing need of keeping books in order, in the first place, to follow the progress of their business and, in the second place, if necessary, to produce the proper justification to the fiscal authority when claiming proportional reduction in taxation if they feel they have been taxed for an income higher than the one they actually have; such figures may also enable them to protect themselves, if necessary, from other forms of taxation. In the new civil code, Fascist legislation has introduced measures, compelling *mezzadri* and crop-sharers to keep accounts (2). It is to be hoped that this example will be followed by many other governments. During recent times, authoritative voices are being raised everywhere in favour of farm accountancy. May they be heard and may all those who have to care for the prosperity of the peasant class understand the value of farm accountancy, when properly used, in increasing the well-being of the peasants and, incidentally, of the community as a whole.

V. — The representative character of accountancy results furnished by the offices.

1. — Some remarks concerning the representative method (3).

Apart from the important services rendered to farmers by helping them to improve their farming methods, farm accountancy offices have also the merit of collecting a large quantity of empirical data of exceptional value in connection

(1) M. Otsuki: "Farm Accounting; its Principles and a System applied to family Farm". Illustrated, Kyoto, 1938.

(2) «Il Lavoro Fascista»: Tuesday, May 7, 1935, Rome.

(3) We owe to Dr. George Pavlovsky the explanations contained in this section.

with studies concerning the agricultural situation and the problems arising therefrom. Indeed, farm accountancy results, duly collected and analyzed, provide first-class statistical material. Competently studied and handled by persons of irreprochable scientific integrity, this material is of enormous value to the economist.

This value, however, depends strictly upon the question of knowing whether the available accountancy data, which usually concern a more or less small proportion of all the farms in a given country or region, may be treated, in all the essential aspects, as representative samples of the whole of which they form a part.

In order that it may be possible to treat them thus, the results of accountancy must be a faithful image, on a reduced scale, of the characteristics of the universe to which they belong, of its distribution in groups and of the peculiar characteristics of such groups. Consequently, only by means of a conscientious analysis of the available accountancy results, and by applying appropriate statistical methods, is it possible to know whether or not these results reproduce with sufficiently close approximation the essential features of the universe. This analysis is often made by the accountancy offices, several of which use their own material in statistical and economic research. Otherwise, it must be made by the person who intends to use the accountancy material in his researches.

Choice of units.

The methods adopted for analysing accountancy results from the standpoint of their representative character, are supplied by statistics. They differ according to the character of the material.

The method known in statistics as the representative method may be founded on two essentially different principles. The units extracted from the given universe and serving as samples may, *a*), be taken by chance or by random sampling, *b*) be the result of a reasoned choice of typical cases. The adoption of one or the other of these methods of selection depends upon the character of the universe which is to be studied by means of samples, on the knowledge of the universe already possessed and on the objects pursued by the investigation. It goes without saying that the choice of typical cases requires a better knowledge of the universe than is required by random sampling.

In the two cases—random sampling or reasoned choice—we have to do with a partial or representative investigation; in both cases, the resemblance of the image to the original is the closer the higher the number of units taken as samples and studied. But from the standpoint of statistical theory the two cases are essentially different, and the methods of analysis which must be used in each of the two cases are not the same.

In the former case, i. e., when the units are taken at random, and when the drawing of a particular unit is purely a matter of chance, our judgement of the more or less representative or typical character of the results of the partial investigation rests upon the principles of the theory of probability which constitutes the essential basis of theoretical statistics.

THEORETICAL PRINCIPLES OF THE OF SAMPLING METHOD

The theory of probability teaches us indeed *that a series of samples taken at random from a given universe whose essential characteristics are known to us in advance, tends to reproduce the characteristics of the universe with an approximation which is the closer the larger the number of samples taken.* This principle is known in the theory of probabilities by the name of the *law of great numbers,* or the *law of errors.* This principle constitutes the essential basis of statistical theory and, in particular, of the method of sampling.

The essential condition for the validity of this law is the following: consecutive drawings must be made strictly at random, *i. e.*, by the very nature of the universe,there must exist no material causes rendering the drawing of a given unit easier and, consequently, more probable than that of another unit; the drawings must not influence each other and, lastly, all the conditions for consecutive drawings must be strictly identical.

We have just given a brief description of the law of errors which the theory of probabilities has deduced from a study of games of chance, where the composition of the universe is known and where it is a question of determining the probabilities of particular drawings; the classical instance of *a priori* probability.

In the case of statistics the situation is different. If, in the case of *a priori* probability, on which the law of errors is based, we start from a knowledge of the constitution of the universe and deduce therefrom the probabilities of deviations in the series of random drawings, when it comes to making a statistical investigation by the method of sampling, we must start from the results of individual drawing which constitute our series in order to deduce the characteristics of the universe which is unknown. The classic instance is therefore inverted, since statistics give us a sample of an unknown universe and since, by an investigation of this sample, we must see to what extent the universe may be taken to possess the characteristics of the sample. This is what is called *a posteriori* probability.

Our manner of reasoning is as follows. If, according to the law of errors, the average of a series of random drawings taken from a given universe tends to reproduce the essential characteristics of this complex, it follows that *the average of a series of statistical observations made on a universe whose essential characteristics are unknown to us, may enable us to draw conclusions regarding this universe, on condition that the number of observations in our series be sufficiently great and the choice of these observations be in conformity with the essential conditions of random sampling.* It is therefore a matter of determining whether in our series of statistical observations the size and the frequency of the deviations from the average of the series approximate those which characterize the normal distribution of chance deviations deriving from the law of errors and represented by a symmetrical curve showing the distribution of deviations on both sides of the arithmetical average of the series. This curve, known as the " curve of Gauss " or " normal curve of errors ", is reproduced in the distribution of deviations in the random drawings

from a universe whose essential characteristics are known, as, for instance, in the distribution of drawings of black and white balls from an urn containing a given number of balls of each of these two colours. As the drawings become more and more numerous, the distribution of the deviations about the average becomes more regular and, when the number of drawings becomes very, not to say infinitely, great, this distribution must correspond exactly to the relation existing between the two colours in the original universe. If we are sure that the choice of observations which constitutes our series has really been made at random, without any influence being exercised upon the outcome of the drawings, and if we observe that the dispersion of deviations from the average of our series approximates the dispersion of deviations of random sampling represented by the normal curve, we may conclude that these deviations are accidental and that our series of observations or drawings may be considered as possessing the essential characteristics of the universe to which it belongs. In this case, as the number of observations gradually increases, the average size of deviations tends to diminish and an increasing proportion of the observations tends to group itself about the average of the series, the dispersion gradually approximating the normal.

Does our material satisfy these conditions?

We have seen that this reasoning is applicable only to a series of observations made according to the essential conditions of random sampling. Our material, as a general rule, does not satisfy these conditions. Consequently, we cannot rigorously apply to it the statistical methods based upon the theory of probability even when dealing with a country where farm accountancy is already well developed and organized; as to the countries where this branch of study has not gone beyond the initial stage, their accountancy data could not in any case be considered as representative. Under these conditions, the application of statistical methods based upon the theory of probability, such as the method of sampling described above, is only possible here in exceptional cases, and mostly by way of accessory control, as a supplementary check upon the results. Consequently, after a brief description of the essential principles of the law of errors on which the statistical method of sampling rests, we shall now say a few words about certain other expedients, less strictly in conformity with the theory, which are used in analysing accountancy data. For the details of the theory and of the technical application of the method of random sampling in the strict sense of the term, the reader is referred to the treatises on the theory of statistics by Julin, Udny Yule, Bowley and Anderson [1], to mention only the best known and most up-to-date.

[1] A. Julin: « Principes de statistique théorique et appliquée »; G. Udny Yule: "An introduction to the theory of statistics"; A. Bowley: « Elements of Statistics »; O. N. Anderson: « Einführung in die mathematische Statistik ».

METHODS OF CONTROL APPLIED TO ACCOUNTANCY RESULTS.

For the analysis of our figures which, as we have seen, do not as a general rule conform to the conditions of random sampling necessary for the strict application of the law of errors, two forms of procedure exist which make it possible to control the representative character of the results. One is based on an analogy with the method of random sampling, while the other is avowedly empirical.

In the former case we reason as follows. If, on the one hand, the series formed by the accountancy results of a given number of farms cannot, as a general rule, be assimilated to series formed by random drawings of units, and, consequently, do no permit of the strict application of the law of errors to the analysis of their dispersion, on the other hand, similar methods of procedure may find justifiable application in this analysis, if not through strict mathematical derivation, at least through legitimate analogy. Since the choice of units in our series was presumably made for the deliberate purpose of obtaining results which would, in so far as possible, be typical of the universe to which our observations refer, it may be assumed that our series must approximate more or less to the universe, so that it also approximates to the series which would have been formed by the random drawing of a large number of units from the universe. It follows that, if our choice of typical units was fair, and if our series is truly representative, the dispersion must, in fact if not in principle, resemble that of a series formed at random the more closely, the better our choice of units was made. Thus, even if it is not possible for us to apply to our material the principles of the theory of probabilities which contemplates only the case of a choice effected strictly at random, the dispersion of deviations in our series must in fact approach closely to that of a series of random drawings.

Consequently, without expecting to obtain an exact reproduction of the dispersion which would have characterized a similar series of units drawn strictly at random, we are entitled to expect to obtain a reproduction which is at least approximate and, in this case, it seems legitimate to conclude that our series of observations, within the limits of this approximation, is just as representative of the universe as would have been a series formed according to the rules of random sampling. By applying this analogy in the analysis of the results of accountancy, as in the numerous other cases of economic research (index-numbers of prices, distribution of wages, etc.), the method of sampling (*Stichprobemethode, échantillonnage*) is often applied to series which do not strictly correspond to the essential conditions of this method, since they are not formed by random drawings. In the following pages, where we describe the studies carried out in various countries, we will have occasion to see how these methods of procedure have been applied to accountancy material in order to determine its representative character.

As regards empirical methods of procedure, the most important of these, and the most effective, is the one consisting in a comparison of certain characteristics of the sample series with certain known characteristics of the universe. When we see that certain essential characteristics of the sample series, such as, for in-

stance, the distribution of land according to methods of cultivation, the distribution of different crops, or certain basic values expressed in relative figures, are similar to those of the universe as shown by general statistics, or if they approach these very closely, we have a *prima facie* proof of the representative character of our sample, and the similarity of these characteristics allows us to conclude to that of the others.

In the following pages we will outline what has been done in various countries in order to ensure that the data used for statistical research be truly typical or representative in character, and to control the accountancy results from this standpoint.

2. — Methods of reasoned selection applied by the offices.

A) GERMANY.

In order to illustrate the methods adopted for the selection of representative or typical farms by farm accountancy offices, we could not do better than mention the German Central Office which is at the present time a division of the *Reichsnährstand*. The information on this subject was given us in 1933 by Dr. H. L. Fensch, Director of this office.

As accountancy work has been carried out in Germany over a long period and on an extensive scale, the German Central Office is in a particularly favourable position for making a reasoned choice of representative farms. It uses the material obtained for its own statistical work and for communication to the Institute.

" The Rural Economy Bureau of the German Council of Agriculture (now the *Reichsnährstand*), centralizes the documentation and carries on statistical studies based on the Reich's accountancies as a whole. It receives extracts of account books from the various accountancy offices; when making these extracts the offices use special standardized and very detailed forms. It goes without saying that the offices select the accounts in such a way as to obtain unexceptionable documentation. They try to include in this documentation the result of farms representative of all the most important forms of farming existing in the Reich. Moreover, they take due account of the characteristic of dispersion of the individual results of each farm. It has, therefore, been possible to collect a documentation which gives a good picture of conditions and results on the great majority of farms in the Reich (1).

As regards the procedure adopted by the German Central Office, Dr. Fensch sent us a letter in 1933 containing the following information:

" In our opinion it is wrong to try to take the smallest farms into consideration when comparing the total number of farms in a country with the number

(1) Dr. H. L. FENSCH: « Résultats de la statistique basée sur les données de la comptabilité agricole en Allemagne ». *Annales de la Commission Internationale d'Agriculture*, Berlin, August, 1933.

of farms in that country where accounts are kept. Of the 5,996,534 farms in Germany, 3,927,431 belong to the group of farms with an area of less than 2 hectares, while 894,454 belong to the group with an area of between 2 and 5 hectares. But the areas of these two groups of farms do not represent respectively more than 6.2 and 11 per cent. of Germany's total agricultural area. The result is that anyone who wishes to study the representative characteristics of the number of farms supplying accountancy results, must leave out at least the farms whose area is under 2 hectares; these farms, indeed, are not farms in the proper sense of the term and can hardly be considered as serving the purposes of scientific accountancy. We are also of opinion that a fair picture of the representative characteristics of the number of farms supplying accountancy results can only be obtained by neglecting also the group of farms with an area varying from 2 to 5 hectares".

Indeed, the German Central Office gave the Institute only the results of farms with an area of over 5 hectares.

As regards the method of choice, Dr. Fensch says: " In Germany the accountancy offices control the results of over 40,000 farms. The accountancy office of the *Reichsnährstand Hauptabteilung II* makes a systematic examination of the results of these 40,000 farms and keeps only 6,000 which are truly representative of German farming as a whole. From among these last, we then select 4,000 farms the results of which are sent to the International Institute of Agriculture, grouped according to production regions and size, so that they are fully representative of the majority of farms in Germany. It appears to us that it is not so much the number as the selection and grouping of farms which gives them their representative character. The large number of farms which send in their accountancy results makes it easier in Germany than in other countries to make a selection of representative farms".

Moreover, the *Reichsnährstand* each year controls the representative character of the farms for which it possesses accountancy results by systematically generalizing the values per hectare of each group of farms belonging to the different size-groups and productive regions and determining values for the whole of Germany. These last mentioned values are compared with the corresponding final figures of the general official census. By systematically completing the original material, it has been possible over a long period of years to keep the generalized accountancy results in full accordance with those of the general return of farms".

B) Other countries.

In Switzerland, as in most countries, farmers wishing to keep accounts enter themselves for an accountancy course and send their books or their extracts to offices or representatives of offices; the farms belong, as a rule, to all systems or to all size groups, and are situated in all parts of the country. The offices make abstracts of these accounts, excluding from the groups the farms which are badly managed or represent isolated cases, and this is where reasoned selection comes in. Each year new accounts are added to the old ones, some farmers

cease to keep accounts, but, as will be seen below when we come to analyse the methods adopted by Dr. Mieczyslaw Sowinski and Dr. W. Pauli, when a certain number of accountancies from all sources has been reached, the individual results which are added do not make any essential alteration in the others. Nevertheless, the averages thus obtained are slightly higher than those of all the farms, because the farmers who take an interest in accountancy are usually the most intelligent and active.

We will now proceed to discuss the work of Prof. Stanislas Kohn, Dr. Mieczyslaw Sowiński, P. C. Mahalanobis, and Dr. W. Pauli, as well as the studies we ourselves have made with the material received from the offices since the agricultural year 1927-28.

3. — Control of the representative character of accountancy resultats.

A) Czechoslovakia: Prof. Stanislas Kohn's researches.

His method.

The method adopted by Prof. Stanislas Kohn rests upon the modern methods of mathematical statistics. The farms chosen by him only represented about one-thousandth part of the total number of Czechoslovakian farms (532 out of 566,035) and the results examined are the average results for the five years preceding the outbreak of the 1914-1918 war [1]. Since the war the number of farms studied by the Prague accountancy office has increased steadily: Prof. Kohn would find to-day that they are much more representative in character.

Prof. Kohn has found it necessary to measure the variability (dispersion) of the series of results of farm accountancy and to determine the number of farms which must be taken to prevent the deviation of averages from going beyond permissible limits. As criterion for measuring variability serves the *standard deviation* (σ), its formula being $\sigma = \pm\sqrt{\frac{\Sigma\, x^2}{n}}$ where $\Sigma\, x^2$ is the sum of the squares of the deviations of the individual observations from the arithmetical average of the series and n the number of observations forming the series. When the standard deviation of the series is known, the limits of chance error of the average is determined as follows. If the distribution of the values in the series is normal, *i. e.* if the values are grouped symmetrically on either side of the average, in conformity with the normal curve of error, 0.843 of all the deviations from the arithmetical average of the series will be contained within the limits of the standard deviation multiplied by $\pm\sqrt{2}$. The modulus $\left(\pm\sqrt{\frac{2\,\Sigma\, x^2}{n}}\right.$ will

(1) These results, together with Prof. Kohn's study, may be found in the publication issued by the Prague Institute of farm accountancy and rural economy, whose director is Dr. Brdlík: « Výrobní podmínky, organisace a výsledky zemědělských závodů v Československu », Prague, 1930.

therefore serve to determine the limits within which will be found 0.843 of all the deviations, while 0.995 of all the observed cases will lie within the limits of the double *modulus* (Table II).

It was by basing his work on these principles that he examined whether the material in Czechoslovakia was sufficiently representative. The selection of farms had not been made by random choice alone. Farms had also been included which were presumably in a better economic position than the average, as is mostly the case in such inquiries which have a tendency to address themselves to the more educated farmers.

As it is impossible to reproduce from all the details of Prof. Kohn's study, we will confine ourselves to giving a table with some of the most interesting results obtained, together with his general conclusions.

Explanation of the figures in Table II.

A comparison of the figures in column 4 with those in column 8 will show the importance of the calculation of chance deviations. It will clearly be seen that the deviations, large in themselves, may be small considered in relation to the modulus; they are fortuitous in character. This depends on the different variability of the different plants cultivated and the different size of the chance deviations possible for the various plants cultivated and for the different productive regions. Thus, for instances, the real deviation of the beet area in the series of observations amounts in the potato region to 31.5 per cent. of the real percentage of the beet area in the total complex; it amounts to 21.7 per cent. in the beet region. It is not more than 0.3 times the size of the modulus, which means that it is not essential. The same may be said for the potato area in the beet region which gives deviations twice the value of the modulus, although they are not as much as 13 per cent. of the real percentage. If one considers as essential only those deviations which exceed the simple modulus (and of course those which exceed the double modulus), one finds that in more than half the cases there is no essential difference between the partial and the total aggregate.

This reveals the non-essential character of the deviations of the beet area in the cereal and potato region, of the potato area in all the regions except the beet region, of the wheat area in the potato region and of the rye and barley area in the beet region.

This table of essential deviations is very characteristic. It is clear that the farms in the series are a little more progressive, having a more commercial character than those in the country generally, especially in the beet and cereal regions. In the beet region, the percentage of beet and wheat area is considerably higher in the series than in the country. Potatoes and oats are not so well represented in the series as in the country, which is exactly in accordance with facts; on the more progressive farms of this region, indeed, potatoes and beets are often replaced by wheat and oats. In the cereal region the more progressive farms reserve a larger area to wheat than to other crops, so that the series is characterized by a higher percentage of area sown to this crop.

TABLE II. — *Areas of plants cultivated.*

	Percentages of area of plants cultivated (partial aggregate) (1)	Percentages of area of plants cultivated (total aggregate)	Deviation	Same deviation in % of figures in Col. 2.	Chance theoretic deviations of figures in Col. 1			The actual deviation exceeds the modulus
					Standard deviation	Modulus c	Double modulus $2c$	
Sugar beets:								
1° Beet region	17.25	14.18	+ 3.07	21.7	0.75	1.06	2.12	2.90 times
2° Cereal region	1.50	1.30	+ 0.20	15.4	0.24	0.34	0.68	0.60 »
3° Cereal and potato region	0.71	0.54	+ 0.17	31.5	0.36	0.51	1.02	0.30 »
Potatoes:								
1° Beet region	5.42	6.23	— 0.81	13.0	0.29	0.41	0.82	2.00 »
2° Cereal region	8.15	8.63	— 0.48	5.6	0.37	0.52	1.04	0.90 »
3° Cereal and potato region	11.34	11.77	— 0.43	3.7	0.35	0.49	0.98	0.90 »
Wheat:								
1° Beet region	14.63	11.90	+ 2.73	22.9	0.67	0.94	1.88	2.90 »
2° Cereal region	8.76	6.57	+ 2.19	33.3	0.41	0.58	1.16	3.80 »
3° Cereal and potato region	4.80	4.81	— 0.01	0.2	0.47	0.66	1.32	0.02 »
Rye: Beet region	11.95	11.65	+ 0.30	2.6	0.51	0.72	1.44	0.40 »
Barley: Beet region	15.45	15.93	— 0.48	3.0	0.57	0.80	1.60	0.60 »

(1) These percentages have been "standardized" according to the distribution of farms by size groups in the total aggregate. For each size category, the area of the farms of the partial aggregate have been expressed as a percentage of those of the farms in the aggregate. The resulting values may be considered as weighted averages of the same percentages of each of the farms belonging to a size group. The area of each of these farms was selected as a weighting coefficient.

As the calculation of the accidental deviation of weighted averages is much more complicated than the calculation of this deviation in the case of arithmetical averages, it has not been possible to calculate the standard deviation of area percentages of plants cultivated in Czechoslovakia (see Table II above) according to the formula indicated above; Prof. Kohn had to make use of the approximative formula of the standard deviation of the quotient of two variables; in our case the variables are the area reserved for the crop in question and the total agricultural area:

$$\sigma_q^2 = \frac{M_1^2}{M_2^2}\left(V_1^2 - 2r_{12}\, V_1\, V_2 + V_2^2\right),$$

M_1 and M_2 being the arithmetical averages of the two variables, V_1 and V_2 being their variability coefficients and r the coefficient of correlation between the two variables. If we call the percentage of the area of the total agricultural area of the partial complex A and if U is the total agricultural area of the farms in the same group in the total complex, the standard deviation of this weighted average will be:

$$\sigma_z = \frac{\sqrt{\Sigma\, \sigma_A^2\, U^2}}{\Sigma U}$$

(σ_A being the standard deviation of a group of farms). By multiplying the standard deviation of the weighted average by $\sqrt{2}$ the modulus is obtained. Consequently, it may be said with a probability of 0.843 that the chance deviation of the standardized percentage of the beet area in the beet region will not exceed the real percentage of the total for the country by more than 1.06 per cent., it may also be said with a probability of 0.995 that it will not exceed it by more than 2.12 per cent.

The author submitted the returns of the beet and wheat harvests in the beet region to a similar analysis. He found that the real deviations exceeded the limits of the single modulus very slightly for both beets and wheat. In the case of beets, the deviation, measured by the modulus, is fairly large, which suggests, that it is not accidental. Here again, the farms included in the series are more progressive than those in the country as a whole.

In any case, the deviations observed may be due to the fact that in the official harvest statistics, used by the author for his comparisons, the estimate of quantities harvested was too low. The fact that the deviations measured by the modulus are larger for wheat than for beets confirms this hypothesis, as the data concerning the beet yield, which were obtained from official statistics and checked by the sugar refineries, are more reliable than those referring to other products.

The author concludes by saying that the calculations by which he controlled his work have convinced him that in making partial research it was impossible to avoid the tendency, common to all research of this nature, to select the most progressive farms where cultivation was most intensive, at least in the beet and wheat regions and, to a lesser degree, in the fodder region.

Selection has no effect on certain characteristics, but the differences between the partial and the total aggregates are more accentuated when the characteristics are closely connected with the nature of the farms and the qualities of the farmers. If this is the case, it is not admissible to use as a basis the characteristics of the series of observations these being the only known characteristics, in order to deduce from it conclusions which hold good for the aggregate as a whole. In so doing one would risk attaching too much importance to certain characteristics closely bound with the nature and intensity of the farms and too little importance to other features. The problem is to determine approximately the direction and limits of the deviations, and to correct the results of partial research in such a way as to render it applicable to the aggregate.

Although the partial complex studied cannot be considered as perfectly representative of the total aggregate of farms in former Czechoslovakia, it does not follow that the results of the series of observations lose all their value and cannot be used. They give us in relation to the aggregate, the characteristics of some of the important laws and interrelations which govern the organization of agriculture.

B) POLAND. DR. MIECZYSLAW SOWIŃSKI'S RESEARCHES.

Farms studied.

Until 1939 the Institute of Rural Economy of Pulawy controlled the accountancy of some hundreds of farms belonging to all the regions of the country. The Institute closed accounts and did statistical work; every year it published the results in: *Badania nad opłacalności gospodarstw włosciańskich* (Research concerning the rentability of farms in Poland) and other publications.

" It would be of great interest, writes Dr. Sowiński, who has studied the representative character of these farms [1], to be able to generalize the results of these researches, in order to obtain a picture of the conditions and situation of the Polish farming as a whole. This depends less on the number than on the quality of the farms. This was already established, over thirty years ago, by the Norwegian statistician KIAER. He introduced into statistics the method of examination *a posteriori*, of the results of partial research, which has been perfected by BORTKIEWICZ. It has also been used by Prof. KOHN and MARCH.

Dr. Sowiński's method.

Dr. Sowiński distinguishes the typological method from the representative method; the latter is naturally more perfect, but the lack of statistical data compels him to use the former and to seek in it the criterion for determining the degree of differentiation of groups which he compares with each other. He finds this degree by establishing the differences between the characteristic values of the partial and the total aggregates; he expresses it as a percentage of the characteristic values of the total aggregate, on the one hand, and of the partial aggregate, on the other hand. The two operations enable him to see to what extent the results of the partial aggregate differ from those of the total aggregate, and *vice versa*. In order to calculate the degree of these deviations, the author uses the average error of the arithmetical mean, expressed as a percentage of the characteristic value of the partial aggregate. Any difference which does not exceed the extent of this error may be regarded as non-essential and accidental.

In order to gain a knowledge of average regional conditions in the total of farms in the various provinces, the necessary data were collected in a special publication entitled " Statistical an territorial sketch of Polish farms". Comparisons are made of land realization, yield per hectare of cereals and potatoes, the use of chemical fertilizers, number of livestock per hectare, milk yield, etc.

The differences arising out of the comparison of characteristic values show immediately to what extent the results of partial research may be generalized.

In order to judge of the general importance of the gross yield of the farms under review, the author compared the productivity of the farms in the partial aggregate with that of the farms in the total aggregate, *i. e.*, gross production per 100 hectares.

In this gross production he showed: milk, pigs, cattle, sheep, marketable products of the soil, with the exception of products consumed by pigs. All these products were reduced to the common denominator of cereals; in the case

(1) In Reprezentatywność zbiorowości próbnej gospodarstw włościańskich objętej badaniem opłacalności ». Warsaw, 1933.

of milk, he used the divisor 1 to convert it into cereals; for the increase in cattle and sheep the divisor 3; for pigs, 6 and for potatoes, 5. The prices used by him to obtain the value of production were those used by the accountancy offices and calculated by the Central Statistical Institute; these were the prices paid to the producer. Since the values of seeds used for sowings and of fodder consumed by draught animals are included in this total and since, on the other hand, it does not contain certain small items of receipts, the author admits that it is very nearly equivalent to the final gross return of the farms; as this is not certain, the differences obtained merely play the part of an approximative standard, making it possible to appreciate the validity of the gross return as a whole and of the other accountancy results obtained by means of partial research. This is very important, the size of the gross return representing in fact a sort of synthetic characteristic of the farm.

Recapitulatory table (Table III) *of the most important deviations of characteristic values of the partial complex* (*accountancy results*) *in relation to those of the total complex.*

Voivodies	Productivity of the area cultivated		Gross production on average farm	
	Deviation in percentage of total complex	Deviation in percentage of partial complex	Deviation in percentage of total complex	Deviation in percentage of partial complex
Poland as a whole	+ 30.9	+ 23.6	+ 112.0	+ 52.8
Pomorze	+ 9.6	+ 8.8	+ 52.9	+ 34.6
Poznań	+ 3.3	+ 3.2	+ 68.5	+ 40.7
Slask	+ 18.5	+ 16.6	+ 79.5	+ 39.6
Łódź	+ 25.2	+ 20.1	+ 124.3	+ 55.4
Warszawa	+ 28.8	+ 22.4	+ 103.5	+ 50.9
Bialystok	+ 17.3	+ 14.7	+ 163.3	+ 62.0
Lublin	+ *45.2*	+ *31.1*	+ 127.9	+ 56.1
Kielce	+ 22.4	+ 18.3	+ 98.8	+ 49.7
Kraków	+ 8.0	+ 7.4	+ 72.9	+ 44.2
Lwów	+ 27.8	+ 21.8	+ 53.3	+ 34.8
Stanislawów	+ 20.0	+ 16.7	+ 43.0	+ 30.1
Tarnopol	+ 23.6	+ 19.1	+ 53.3	+ 35.0
Wolyń	+ 19.8	+ 16.4	+ *178.5*	+ *64.1*
Polésie	+ 17.2	+ 14.7	+ 109.3	+ 52.2
Nowogródek	+ 7.7	+ 7.1	+ 139.4	+ 58.2
Wilno	+ 27.9	+ 21.8	+ 147.8	+ 59.6

Causes of divergences observed in the recapitulatory table (Table III).

The divergences observed between the productivity of the partial aggregate and that of the total aggregate exceed, except in a few cases, the average error of the arithmetical mean; they are therefore considerable. These differences,

whether we take the results for the whole of Poland or those for the southern and central parts of the country and a few other voïvodies, are so great that they seem to exceed all possible limits of error in estimation and in the general statistics on which the author bases his calculation of results in the total aggregate.

But in actuel life wide divergences are also found between the productivities of farms, some amounting to as much as 200 and 300 per cent. and even more; this shows that in the partial aggregate, if the choice has not been judiciously made, wide unilateral divergences may also be registered, especially when the partial aggregate is too small in proportion to the total aggregate, as in our case. Seen from this angle the results of our research prove that the partial aggregate formed by the Polish farms whose accountancy results are analyzed by the offices are better suited than might have been thought for the generalization of average results of farms per hectare.

These divergences are so wide only because, in respect of the distribution by size groups and by average size, the farms selected are not representative. As a matter of fact, our partial aggregate contains a percentage of large peasant farms with a low productivity proportionally much higher than that contained in the total aggregate. If the proportion were fair, the average productivity would be increased by 30 per cent., on an average for certain voïvodies and by 10 per cent. for the whole of Poland.

The situation, which is not of a typical (representative) character, when regarded from the standpoint of distribution of farms by size groups and which proves unsatisfactory for the study of farming methods and labour, as well as for studies of standard of living, appears more satisfactory when viewed fom the standpoint of productivity. To the adjustment of these divergences we owe the fact that the gross return and the values resulting therefrom (net return, etc.), more nearly approach reality than do similar results bearing upon agrarian structure obtained by means of a representative partial aggregate.

The author admits that he could not, with the aid of the material supplied by accountancy, demonstrate why the farms in the various size groups gave better results. But his general observations seemed to authorize him to admit that the small farms selected formed a better *élite* than did the large farms. He concluded from this that if he had had results available for a larger number of large farms, the difference between the productivity of the total aggregate and that of the partial aggregate, weighted on the basis of ditribution in groups of the total aggregate would have been smaller (1).

It is to the arbitrary selection of farms that the lack of characteristic typical features in the partial aggregate is due. Among the newcomers in accountancy,

(1) In the October, 1933 issue of the *Bulletin of Agricultural Economics and Sociology*, we published an article in which we studied the representative character of large Polish farms; we observed that at least 60 large farms from every region were necessary in order to achieve a stability in the characteristic values.

one finds indifferent farmers, poor workers, burdened with debts, who see in accountancy only a miraculous escape from their pecuniary difficulties. There are others who take such a keen interest in accountancy and who are so active in this connection, that they sometimes even end by neglecting their agricultural work. But generally speaking, farm accountancy attracts the most capable peasants; and since these latter represent the majority of those who hand in their accounts to the accountancy offices, the average level of farms controlled by the offices is higher that than of the farms in the total complex.

Essential conditions of the choice of farms.

Up to the present, says the author, the chief preoccupation in Poland has been to obtain *the number of farms* necessary for research work. Sufficient attention has not been paid to the *importance of the proper choice* of these farms. A slight advance in this sense has, however, been made recently. Prof. WITOLD STANIEWICZ, head of the Economic Section, has suggested that particular importance should be attached to the selection of farms on which to introduce accountancy, and that an attempt should be made to replace quantity with quality.

The method of random choice requires a large number of units, otherwise one cannot be certain of obtaining the desired results. Its great value is due to the fact that it is easy to apply and independent of any bias on the part of those carrying out the survey. It certainly insures greater objectivity. Although it is true that when the number of investigations is not very large there is a possibility of considerable differences, but these differences are only due to chance and are compensated as soon as the number of units observed is increased; this number may be easely increased by the addition of results for several years.

The chief factor which compromises the efficacy of this method is the necessity of having recourse to random choice for studying certain farms, when, in order to guarantee a good result, the willingness of the farmers on small farms and their aptitude for accountancy cannot be overlooked. Random choice cannot accordingly be used otherwise than in combination with the method of selection, which should be directed towards those farms whose farmers keep accounts of their own free will. The farms should continue to be distributed throughout the country. The result depends upon the number of registrations exceeding the number considered necessary, as well as on the quality and choice of farms which should correspond to selective standards. These standards may be deduced from the characteristics of the total aggregate of peasant farms. As regards this characteristic itself, it should comprise each of the groups and types, take account of their reciprocal relations, cut so deeply into the total aggregate as to make it possible to obtain a representative partial aggregate, a true miniature of the total.

In order to obtain this characteristic, the author considers that it is not necessary to undertake exhaustive research; it suffices to use the method of random choice, on condition that a fairly large amount of material is available.

The results which will be obtained.

This characteristic will only enable us to know the average qualities which the partial aggregate should possess. When we are sure that these average values are typical, we can taxe this characteristic as a standard for the choice of farms, *i. e.*, those farms will be selected whose features most nearly approach the average features of the sample.

But there is a disadvantage to this: the partial aggregate thus formed may not include a large number of important groups belonging to the total aggregate. This may be remedied by using the typological characteristic for half the farms to be selected, choosing the others at random from among those farmers willing to keep accounts.

It goes without saying, continues the author, that such a solution of the problem is incomplete, but none the less it offers better conditions for success in research than those used up to the present.

The author concludes: statistics based on accountancy results constitute one of the objectives of the comparative statistics of the International Institute of Agriculture in Rome. This is why the questions discussed in his study are of general importance and should be studied in other countries. Then, and only then, the statistics based on accountancy results in the various countries will have the scientific and practical value which is expected of them.

C) British India. P. C. Mahalanobis researches.

In the case of rice cultivation P. C. Mahalanobis has calculated the deviations in labour cost and in profits on a certain number of Bengal farms (1). The results have been condensed in the table IV.

The important thing to observe, in the first place, after examining this table, is the large variability, of the order of 20 and 30 per cent., which introduces a high corresponding degree of incertitude in the estimates. For instance, the average total human labour required for cultivating an acre of paddy was 36.3 man-days with a standard error of about 1.67 man-days; at the rate of 4 annas per day, the probable error in estimating cost of human labour is over 4 annas. In the same way, the probable error of the yield of paddy is about 0.4 *maunds* per acre, which at the rate of 1/8/0 rupees per *maund* means an uncertainly of nearly 10 annas in the gross value of the production. The gross return of rice and straw may be estimated at 2.03 rupees per *maund*, giving 35 rupees for 17.24 *maunds*, with a standard deviation of 5.7 rupees ($N = 24$). The cost in money, of 36.3 man-days amount therefore to 9.08 rupees with a standard deviation of 2.79 rupees ($N = 45$). The average difference between gross return and cost of labour is therefore 25.92 rupees; the standard error is 1.25

(1) P. C. Mahalanobis. Editorial Note on the Margin of error in the calculation of the cost of cultivation and profit, Sankhyā, the *Indian Journal of Statistics*, Calcutta, 1936.

TABLE IV. — *The deviations of the samples studied.*

	Number of samples		Average (m)	Standard deviation calculated (1) (σ)	Variability $\frac{100\ \sigma}{m}$	Standard error of the average
Total labour for the whole crop	45	(2)	36.30	11.17	31	1.67
Labour employed with buffaloes	8	(2)	19.63	2.70	14	0.95
Rents paid per acre . . .	24	(3)	4.06	0.91	22	0.19
Land capital	24	(3)	138.10	18.40	13	3.76
Quantity of rice harvested per acre	24	(4)	17.24	2.85	17	0.58

(1) $\sigma = \sqrt{\frac{\Sigma x^2}{N}}$ (x is the deviation).

(2) Man-days.

(3) Rupees.

(4) Maunds (100 lbs. weight).

rupees and the probable error 0.83 of a rupee or about 13 annas. In other words, all that may be said on the basis of the data collected, is that the difference between the gross return of the rice crop and the cost of human labour lies between 25/2/0 and 26/12/0 rupees. The margin of error is thus about 1/10/0 rupees, or nearly 5 per cent. of the gross return. In order to reduce it to less than 1 per cent., the number of observation would have to be multiplied 25 times or raised to 500.

The author concludes that the statistical method can only be used with advantage for estimating directly observable or measurable quantities; that if these facts are to be defined one must find clear and objective terms and lastly, that the great variability of almost all the factors entering into the cost of cultivation and profit make it indispensable to use samples of a large size and of a sufficiently representative character to allow averages being calculated with a fair degree of accuracy.

D) SWITZERLAND. DR. W. PAULI'S WORK.

Dr. W. Pauli's method.

Dr. W. Pauli, who in 1913 investigated the representative character of the results of Swiss farm accountancy (1), uses the term ***probable variation*** for the influence exercised by an individual result when added to an average already estab-

(1) Dr. W. PAULI,: "Produktionskostenberechnungen in bäuerlichen Betrieben", Thünen Archiv Jena, 1913.

lished; it may be determined with the help of the theory of probability. When the average of a large number of observations is established, it is found that few individual results correspond to the average, but the deviations show a certain regularity. In order to find the law, Dr. Pauli adds all the differences without paying attention to the signs and divides the total by $\sqrt{n(n-1)}$ n being the number of observations. He then multiplies the quotient by a constant factor 0.843, thus obtaining the probable variation (r). The frequency of the appearance of this last is regulated by the Gauss law expressed by the symmetrical curve bearing his name. Following Mitscherlich, he uses the formula

$$r = \frac{\text{Sum of the differences } [\pm v] \times 0.843}{\sqrt{n\,(n-1)}}$$

to show that the calculations of net return and production costs are in conformity with the law of errors. From the accountancy results for 1909 he has chosen some series of observations corresponding to the group of Swiss dairy farms. The following table shows the cost of production and probable variation (r), for 100 kg. of milk:

TABLE V. — *Probable variations on a series of Swiss dairy farms.*

Farms	Number of farms	Average of 5 observations		Average of 10 observations		Average of 15 observations	
		Swiss francs	r	Swiss francs	r	Swiss francs	r
Farms cultivating mixed fodders:							
a) *Receiving skimmed milk in exchange:*							
Average of first 5 farms	(15-292)	17.34	± 2.70	17.46	± 1.77	17.86	± 2.43
„ „ next 5 „	(296-426)	17.59	± 1.27				
„ „ „ 5 „	(511-603)	18.65	± 4.15	18.20	± 3.21		
„ „ „ 5 „	(604-727)	17.74	± 2.76			17.23	± 2.75
„ „ „ 5 „	(791-827)	18.05	± 3.42	16.97	± 2.93		
„ „ „ 5 „	(829-841)	15.89	± 2.84				
„ „ „ 5 „	(842-857)	19,22	± 3.99				
b) *Not receiving skimmed milk in exchange:*							
Average of first 5 farms	(78-373)	18.03	± 1.66	17.95	± 2.77	18.06	± 2.31
„ „ next 5 „	(391-432)	17.88	± 3.23				
„ „ „ 5 „	(457-774)	18.26	± 2.61	18.02	± 3.33		
„ „ „ 5 „	(731-838)	17.78	± 4.43				

Results obtained.

When the number of farms is limited to 5, the probable variations of the average show wide differences. The same may be said of the average for 10 farms. It is only when at least 15 individual results for *farms of the same type* have been taken that the probable variations compensate each other in a satisfactory way so that the average of at least 15 results from similar farms permits definite conclusions to be drawn and applied in practice.

When less homogeneous groups are formed of farms from all over the country and no longer only of farms belonging to a group engaged in particular form of production, a much larger number of farms is necessary to ensure the stability of the averages or, in other words, to obtain averages which are only modified to a negligible extent by the addition of results from other farms.

The Brougg accountancy office has carried out such experiments annually. The following table shows that when the groups consist of at least 100 farms, the averages no longer show noticeable alterations.

Number of farms	Net return on % of total capital invested in 1922	Household expenses per diem for board for one man
84	1.90	2.20
114	1.71	2.42
154	1.73	2.43
194	1.88	2.44
234	1.74	2.43
274	1.65	2.44
313	1.60	2.45
400	1.62	2.48

The accountancy office of the Swiss peasant Secretariat at Brougg has arrived at the following conclusion: although each year research concerning profitableness covers a certain number of new farms, while others drop out, if the number of farms is sufficiently large, the average composition of the controlled farms remains the same in many characteristic aspects (area, degree of intensity, gross return, etc.). It is, therefore, possible to make reliable comparisons, not only between the general averages but also between the averages for each group of farms. Every annual average plays a part in the *relative average* for the whole country and is comparable with that of another year. This is why the Secretariat's averages make it possible to form an increasingly accurate idea of the real situation of Swiss agriculture.

E) Denmark and Sweden. Analysis of results.

It seemed to us that it would be interesting to use Dr. Pauli's formula for the study of probable variations in two groups of Danish and Swedish farms. The individual results are taken from the material of the offices for the years 1938-39 ([1]). For Denmark we have chosen the group of farms with an area of less than 10 hectares. Here are the variations obtained:

$$r = \frac{\text{Sum of the differences } [\pm v] \times 0.843}{\sqrt{n\,(n-1)}}$$

Table VI. — *Net return in % of total capital invested in 197 Danish farms under 10 hectares in area in 1938-39.*

15 farms		30 farms		45 farms		60 farms		197 far	
average	r	average	r	average	r	average	r	average	r
2.46	± 2.53	3.32	± 2.40	4.45	± 2.74	4.49	± 2.58	4.63	± 2.69
4.18	± 2.36								
6.70	± 3.51	5.66	± 2.79						
4.63	± 2.17			3.97	± 2.11				
3.22	± 2.01	3.65	± 2.12			4.43	± 2.52		
4.07	± 2.30								
6.01	± 3.87	4.92	± 2.97	4.49	± 2.90				
3.82	± 2.18								
3.64	± 2.86	4.82	± 2.69			4.86	± 2.83		
6.01	± 3.30			5.29	± 2.86				
6.66	± 3.56	4.93	± 2.86						
3.20	± 1.91								
([1]) 5.53	± 3.22								

([1]) 17 farms.

The figures in the table show that in order to obtain the same probable variation it was necessary to establish an average of at least 45 farms and a maximum of 60 farms belonging to the size group of less than 10 hectares throughout the whole of Denmark. This confirms what we have said in the case of Swiss farms, namely, that when the groups contain at least 100 farms, the averages

([1]) " Undersögelser over Landbrugets Driftsforhold. Regnskabsresultater i Aaret 1938-39", Copenhagen, 1940, and Räkenskapsresultat från Svenska Jordbruk, Året 1938-39. Stockholm, 1941.

no longer show any significant alteration. The following figures show that results for the size groups are very similar one to another when the number of farms approaches 200.

	Number of farms	Net return in % of total capital invested for Danish farms in 1938-39
Farms with area under 10 hectares	197	4.6
„ „ „ from 10 to 20 hectares	175	4.8
„ „ „ „ 20 „ 30 „	169	4.5
„ „ „ „ 30 „ 50 „	191	4.3
„ „ „ „ 50 „ 100 „	94	3.9
„ „ „ exceeding 100 hectares	51	3.7
All farms	877	4.5

For Sweden we will select 146 farms whose average area varies from 10 to 25 hectares, all situated in the central part of the country.

TABLE VII. — *Net return in percentage of total capital invested for 146 farms in Central Sweden, 1938-39.*

15 farms		30 farms		45 farms		60 farms		146 farms	
average	r	average	r	average	r	average	r	average	r
3.57	± 2.13	5.27	± 2.59	5.04	± 3.06	4.96	± 2.88	4.68	± 2.68
6.98	± 2.95								
4.57	± 4.32	4.65	± 3.33						
4.73	± 2.46			4.85	± 2.65				
5.55	± 1.90	4.91	± 2.78			4.58	± 2.63		
4.27	± 3.76								
4.46	± 2.65	4.25	± 2.53	4.47	± 2.58				
4.03	± 2.50								
4.91	± 2.79	(2) 4.26	± 2.42						
(1) 3.37	± 2.04								

(1) 11 farm. — (2) 26 farms.

No comment is necessary concerning the figures in this table: the same conclusions may be drawn from it as from the figures in the preceding table VI.

If, therefore, the average is determined for a very large number of observations from any source whatsoever, few individual results are found to correspond to the average. But, although no farm is similar in every point with the one which it most nearly resembles, most of the extreme cases of disparity have

nevertheless been included in the number of farms. The majority of individual results is concentrated around the average. Indeed, if we establish size groups of net return in percentage of total capital invested, we find, in the case of the Danish and Swedish farms studied above, the following table and diagram.

Size groups for net return as a percentage of total capital invested on 197 Danish farms with area of less than 10 hectares and 146 farms in central Sweden.

Groups	Denmark		Sweden	
	number of farms	%	number of farms	%
— 6 to — 4	2	1	3	2
— 4 „ — 2	6	3	5	3
— 2 „ 0	10	5	5	3
0 „ 2	27	14	23	16
2 „ 4	43	22	21	15
4 „ 6	45	23	38	26
6 „ 8	24	12	19	13
8 „ 10	22	11	18	12
10 „ 12	9	4	11	8
12 „ 14	6	3	0	0
14 „ 16	3	2	3	2
— 6 to 16	197	100	146	100

DIAGRAM. — *Distribution of two groups of Danish and Swedish farms according to category of net return in % of total capital invested.*

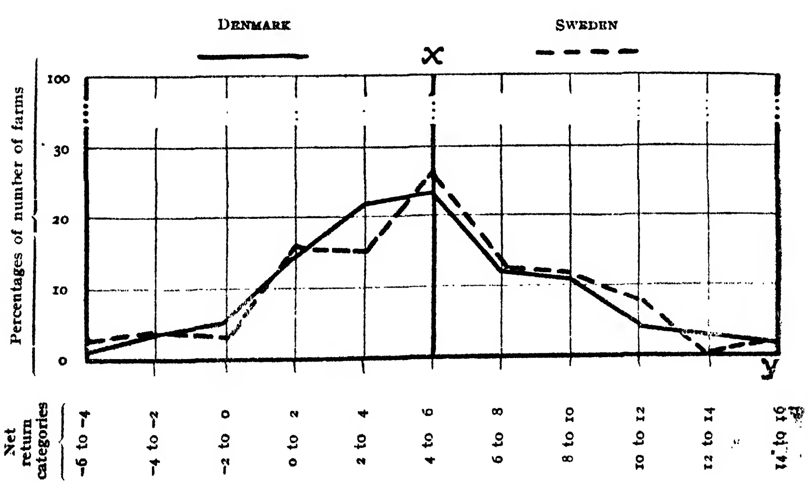

TABLE VIII. — *a) Percentages of cultivated area according to the International Yearbook of Agricultural Statistics. — The same percentages according to accountancy data.*

Country		Year	Areas cultivated						
			Cereals	Root Crops	Artificial meadows	Others	Permanent meadows and pasturage	Vineyards and gardens	Total
Denmark . . .	a)	1927-30	44.56	17.32	24.94	2.97	10.21	—	100
		1930-33	42.19	16.73	24.05	2.13	14.90	—	100
		1933-36	43.18	17.14	23.76	2.10	13.82	—	100
		1936-37	43.07	16.94	23.57	2.63	13.79	—	100
	b)	1927-30	44.10	18.40	—	2.50	(1) 35 —	—	100
		1930-33	43.10	18.30	—	2.50	(1) 36.10	—	100
		1933-36	42.70	17.90	—	2.30	(1) 37.10	—	100
		1936-37	42.90	18 —	—	2.40	(1) 36.70	—	100
Germany . . .	a)	1927-30	41.91	15.43	8.91	3.86	27.50	2.39	100
		1930-33	41.71	15.22	9.20	3.67	27.75	2.45	100
		1933-36	41.24	15.58	9.40	2.69	28.47	2.62	100
	b)	1927-30	50.96	14.11	12.15	2.14	20.64	—	100
		1930-33	50.74	12.94	11.28	3.64	21.40	—	100
		1933-36	51.03	14.95	10.76	2.91	20.35	—	100
Poland	a)	1927-30	44.39	11.56	8.43	8.26	25.36	2 —	100
		1930-33	46.68	11.84	6.67	7.29	25.38	2.14	100
		1933-36	46.06	12.43	6.64	7.40	25.31	2.16	100
		1936-37	46.16	13.07	6.78	6.52	25.31	2.16	100
	b)	1927-30	50.55	14.61	11.38	4.41	16.29	2.75	100
		1930-33	51.67	14.06	11.12	3.56	17.18	2.41	100
		1933-36	50 —	14.46	12.61	2.92	17.44	2.57	100
		1936-37	48.93	15.32	12.28	2.77	18.19	2.51	100
Latvia.	a)	1929-30	23.45	2.67	13.02	13.04	46.87	0.95	100
		1930-33	23.45	2.67	13.02	13.04	46.87	0.95	100
		1933-36	27.87	4.19	14.41	8.90	43.95	0.68	100
		1936-37	27.87	4.19	14.41	8.90	43.95	0.68	100
	b)	1929-30	24.20	4.15	17.66	10.08	42.54	1.37	100
		1930-33	24.52	4.85	22.12	6.71	40.55	1.25	100
		1933-36	25.79	5.21	25.04	4.28	38.50	1.18	100
		1936-37	25.95	4.67	18.78	10.83	38.68	1.09	100
Sweden	a)	1927-30	45.29	7.05	39.46	8.20	—	—	100
		1930-33	45.40	7.43	40.48	6.69	—	—	100
		1933-36	42.73	7.25	43.55	6.47	—	—	100
		1936-37	41.58	7.22	44.83	6.37	—	—	100
	b)	1927-30	44.45	9.38	37.85	8.32	—	—	100
		1930-33	45.23	11.04	36.67	7.06	—	—	100
		1933-36	46.99	11.32	35.56	6.13	—	—	100
		1936-37	46.20	13.40	36.60	3.80	—	—	100

(1) Including artificial meadows.

VI. — Conclusion.

The simplest statistical work, with which the Institute was faced from the outset, was the establishment of annual averages of results; this work has been done by the majority of the offices on their own account and it may be said that in most cases these averages referred to a sufficient number of farms; it may also be said that, generally speaking, they were selected in such a way as to be characteristic of a given region or of a method of cultivation.

Only one or two examples from our annual volume "Farm Accountancy Statistics", will suffice to demonstrate it; these figures refer to cultivated area. In the table VIII we show, for several countries, the percentages of cultivated area calculated on the basis of data contained in the *International Yearbook of Agricultural Statistics*, on the one hand, and on the basis of the farm accountancy data, on the other hand.

The percentage of artificial meadows is slightly higher in the partial (*b*) than in the total aggregate (*a*). This is due to the fact observed by Prof. Kohn and Dr. Sowiński: the farms whose books are controlled by the offices are selected from among the most progressive and intensive farms. When taken as a whole, the series under review are, nevertheless, so close one to the other as regards composition that they may be said almost to coincide. The number and area of farms keeping accounts are sufficiently representative to permit the values obtained to reflect the agricultural situation for most of the countries under review. Although the number of farms controlled up to the present by the offices of some countries, such as the Danubian States, France, England, British Indies, etc., is not sufficient to supply reliable averages, it would not be advisable to eliminate the results obtained from these farms. After making due allowances, we may use them for studying some of the features of agriculture in these countries.

To sum up we may say:

a) that the work done by the International Institute of Agriculture in connection with farm accountancy until the outbreak of war was considerable;

b) that there are still regrettable gaps in the figures which, it is to be hoped, will be filled as soon as normal conditons are re-established;

c) that all the offices have not as yet accepted the terminology and methods of Prof. Laur adopted by the Bucharest Agricultural Congress in 1929 and by the International Institute of Agriculture; we hope to see all the offices adopt the same method;

d) that we hope to see farm accountancy offices established in every country;

e) that the more or less empirical methods adopted for the control of the representative character of accountancy results make it possible to assert that in a large number of cases the averages for groups belonging to partial aggregates are sufficiently close to those of total aggregates;

f) that up till the present the averages for partial aggregates are slightly higher than those for the respective total aggregates, because the farmers who keep account books are mostly found among the best qualified of their class;

g) that the number of results in some countries is not yet large enough to include them in an international collection of figures as representative averages. " It is highly desirable, says Dr. Howald (1), that statistical work based on accountancy results should be developped in these countries. We have still too few data concerning overseas countries. In the last few years it has, however, been possible to use statistical data referring to between 1,500 and 2,000 American farms ".

(1) Dr. O. HOWALD, Internationale Aufgaben der Buchführunsauswertung, Zürich-Brougg, 1938.

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THE FOOD SUPPLY PROBLEM IN THE UNITED KINGDOM DURING THE WORLD WAR 1914-1918

by Helgo LINDSTEDT.

SUMMARY: *A*. Initiation and development of food control. — *B*. Maintenance of food supply by imports. — *C*. Efforts to increase the homegrown food supply: obstacles and achievements. — *D*. Measures for a more economic utilization of the agricultural produce and for a fair distribution of the food supply. — *E*. Result of the food supply policy as shown by statistical data on consumption and rationing and other statistical evidence.

A. — Initiation and development of food control.

When the war broke out in August 1914, there did not in the United Kingdom, as little as in other countries, prevail any suspicion that the question of food would come to play an important part in determining the result of the great struggle. In the " War Book " of the British Government, containing plans for ensuring the safety of the country in case of war, the only reference made to food was a measure for obtaining information as regards retail prices. It was generally believed that a modern war could not possibly be of long duration and that the command of the seas would, as in peace-time, keep the markets of the world open to British shipping and secure the arrival of all the food-stuffs needed to make up the large deficiency in the home-grown food supply, in normal times furnishing only about one-third of the total energy requirements of the nation (1). British farming was not, it was further generally believed considered capable of any large increase in food production in the course of a great war and no plan with such an object in view was ever drawn up by any expert.

As regards the belief that the British Navy and mercantile marine would be able to secure a satisfactory food supply for the British people, this belief showed itself during the first two years of the war to be better founded than even the most sanguine had expected and, though empowered under the Defence

(1) MIDDLETON, Th. H.: Food Production in War, Oxford, 1923, p. 90. – The estimate of the Royal Society's Food (War) Committee—according to which about 42 per cent. of the food calories furnished to the people of the United Kingdom in 1909-13 were derived from imports—was, as shown by Middleton, too high (*Ibidem*, pp. 87 and 90).

of the Realm Act passed in August 1914, to take all necessary steps for ensuring "the public safety and the Defence of the Realm" without referring to Parliament, the only measures of importance that the Government found it necessary to take during these first two years to safeguard the food supply of the nation were the prohibition of the exports of food and feeding stuffs except by licence, some secret purchases of wheat to secure hidden reserves and the appointment of a Sugar Commission to regulate the imports and supplies of sugar, a staple two-thirds of which in time of peace came from Austria-Hungary, then completely cut off from the British market.

As regards home production it is true that during the first two years of war the Board of Agriculture endeavoured to facilitate the task of the farmers by helping them to overcome the shortage of labour, fertilizers and feeding stuffs, but the freedom of the famers in managing their lands was in no way interfered with. The farmers were advised to grow certain crops, but they were not compelled to do so and there was offered them no pecuniary inducement to modify their customary practices. Proposals to guarantee a minimum price for wheat or to give bounties on production, such as those set forth for instance by the so called Milner Committee, were turned down on the broad principle that all interference with the free play of the market would be detrimental to the confidence of the trade and would reduce imports more than the production was increased [1]. And even among experts during the first period of the war so little foreseen was the gravity of the coming food situation and so little was realized the necessity of a more economic utilization of the soil and it products, that in one of the guiding press notices for farmers issued in August 1914 by the Consultative Committee of expert agriculturists set up by the Board of Agriculture, simultaneously with the recommendation of the strictest economy and foresight with regard to feeding, farmers were urged wherever possible to increase the total head of live stock and « particularly animals such as pigs " the worst competitors with man for foodstuffs [2].

Towards the end of 1916—when the toll of sunken ships had reached an alarming total, food prices had risen considerably causing widespread discontent, the home potato crop had partially failed, the supplies of sugar had decreased appreciably and the American harvests had fallen short of the bumper crops of the preceding year which had left an abundance of grain for export—the situation, however changed and it became evident that it was impossible any longer to rely only on voluntary action for the safeguard of the food supply of the nation. Several Government measures with that end in view were then taken—the appointment of a Royal Commission on Wheat to ensure adequate and regular wheat supplies, regulations on maximum prices for milk, on closer milling of wheat, on limitation of meals in public eating-houses, etc.—and immediately before Christmas 1916 the Governement appointed a Minister of

(1) " Agriculture ", Encyclopaedia Britannica, 12th Ed., Vol. XXX, London, 1922, p. 78.

(2) MIDDLETON, *Op. cit.*, p. 105.

Food designated as Food Controller with dictatorial powers " to regulate the supply and consumption of food in such a manner as he thinks best for maintaining a proper supply of food and take such steps as he thinks best for encouraging the production of food " [1].

From now on there takes place under the guidance of the Board of Agriculture, to which the Food Controller had handed over in this respect his nominal powers, and the local War Agricultural Committees, as its authorized representatives, a more energetic Government action for increasing the home production of foodstuff: the ploughing up of grassland for extending the cultivation of cereals and potatoes is encouraged and if necessary enforced, the supply of labour horses, tractors, fertilizers and feedingstuffs to the farmers is facilitated, the allotment garden movement promoted, etc. We see too the building up of a vast Ministry of Food, the coming into function of the domestic organizations working under it for the administration and enforcing of the various schemes for distribution and rationing—the Divisional Food Commissioners and the roughly 2000 Local Food Control Committees—and the establishment of several important governement bodies, besides those already existing Sugar and Wheat Commissions, for the buying of foods in foreign countries, by means of different methods of purchase and mostly, in order to avoid competition, in close cooperation with the other allied powers. And we find how, step by step, chiefly in the course of the latter half of 1917, nearly everything catable and drinkable imported in the United Kingdom or home produced is bought or requisitioned by the Governement at fixed prices and afterwards distributed through the normal channels likewise at fixed prices or allowing definite margins of profit.

During the last two years of the war more radical Government measures are also taken in order to safeguard the most economical use of the food supplies and save them as far as possible for human consumption: the milling of wheat is growing steadily closer, the restrictions as regards the use of cereals in brewing, distilling and the feeding of livestock more severe, etc.

Individual compulsory rationing as a means of ensuring equitable distribution of foodstuffs, however, is long in coming. Only at the end of 1917, when the havoc wrought by the submarine warfare combined with the increasing demand of the fighting forces for shipping space had made still more serious inroads into the tonnage available for the imports of food and caused a shortage of some essential foodstuffs, food queues and grave discontent, did the institution of individual rationing appear as an urgent necessity in Great Britain. At first, in December, 1917, rationing for certain foodstuffs was, however, only established locally in some large cities; nationally, from January 1, 1918, to begin with, only sugar was rationed, and not before the spring and summer of 1918 were national rationing schemes introduced for a number of other foodstuffs: butter and margarine, lard, bacon and ham, meat, jam, marmalade and tea.

(1) BEVERIDGE, W. H.: British Food Control, London, 1928, pp. 426-427.

B. — Maintenance of the food supply by imports.

Did, however, the British Food Administration through the various measures adopted for safeguarding the imports of foodstuffs during the last two years of the war succeed in its task of furnishing the necessary complement to the home-produced food supply? Undoubtedly yes. There was, it is true, a considerable and practically constant decline in the total food imports—between 1913 and 1918 the net imports of the principal foodstuffs thus decreased, from approximately 18.3 to about 11.9 million tons or about one-third [1]—but the unfavourable consequences of this decrease were to a great extent overcome by reserving the available tonnage for the most essential products: for wheat and flour, bacon, the oilseeds absolutely indispensable for food purposes and for the margarine industry, refrigerated meat, dairy produce and sugar and by concentrating on the most easily defended and shortest sea route, namely, the route across the Western Atlantic to U. S. A. and Canada, which countries during the war both became in a steadily increasing degree the principal suppliers of the United Kingdom with most of the essential foodstuffs mentioned. Between 1913 and 1918 the percentage of gross imports to the United Kingdom from U. S. A. and Canada thus rose, as shown by Table I [2] for wheat and wheat flour from 57.2 to 77.4 per cent., for refrigerated meat from 1.7 to 36.2 per cent., for bacon and hams from 50.7 to 98.9 per cent., for dairy produce from 10.6 to 50.4 per cent., and for sugar from 11.6 to 63.5 per cent.

TABLE I. — *Percentages of food imports (gross) to United Kingdom furnished by United States and Canada in each year from 1913-1918.*

Foodstuffs	1913	1914	1915	1916	1917	1918
Wheat and flour	57.2	66.2	73.1	87.2	80.1	77.4
Meat	1.7	3.0	12.7	15.7	16.3	36.2
Bacon and ham	50.7	45.5	73.3	79.5	82.7	98.9
Lard	95.8	96.8	98.3	98.5	93.8	97.0
Dairy produce	10.6	11.4	20.2	31.9	35.3	58.4
Sugar [1]	11.6	19.4	37.1	54.6	54.6	63.5

(1) Cuba included with United States.

Serious difficulties of various kinds had, however, naturally often to be overcome. The concetration of trade upon one route and the fact that it was so largely a one-way trade frequently made it a hard task for the treasury to find

(1) BEVERIDGE, W. H.: *Op. cit.*, p. 358.
(2) BEVERIDGE, W. H.: *Op. cit.*, p. 134.

means of financing its purchases. When, as in Australia, there was wheat in abundance and no difficulty about paying for it, there were no ships for its transport and when, on the other hand, wheat and other food products could be had in North America, there was the constant difficulty in obtaining the dollars with which to pay.

As to the imports of *wheat*, its two most critical periods occurred in the springs of 1917 and 1918. In the first case, owing to the impossibility at that time of bringing in the Australian holdings, to the short harvest of North and South America, to the closing of the Dardanelles cutting large and convenient markets, and to the high proportion of cargoes lost through the submarine warfare, the stocks of wheat and flour in United Kingdom were brought down to such a low level that the Government was within an ace of allowing the introduction of bread rationing, a measure that it was its policy by all means to avoid. Large supplies from North and South America received in June and July, however, banished all danger of the necessity of applying this measure.

The crisis in 1918 was largely due to the shortage of the exportable surplus of wheat in U. S. A., a shortage, presumably to no small extent, caused by the American " food conservation campaign ", which induced consumers to eat less meat and more cereals, and producers, under promise of remunerative prices, to produce more meat and especially bacon and lard for the Allies, a policy directly contrary to that advocated in Europe, but no doubt from the point of view of tonnage, at that time the all important concern, right in principle, bacon yielding, weight for weight, far more calories than grain. The critical situation at that time, which called forth strong representations from the Allied Governments to America as to the needs of breadstuffs, was, however, solved in March, 1918 when, in order to assent to the request of the European Allies, new restrictions on cereal consumption were introduced in America, thus again removing the danger of rationing the bread in Great Britain (2).

Sugar was another staple food whose importation caused anxiety to the British food authorities, but not until the end of 1916, when, owing to the shortage of ships, the Sugar Commission was no longer able to meet without delay all the demands for sugar and saw itself forced to cut down its distribution to wholesale dealers to 60 per cent. of the 1915 quota, requiring the wholesalers to distribute to retailers on the same basis. In the spring of 1917, however, owing to many sugar cargoes being lost by submarine sinkings, the situation for the first time became really critical. On a certain day in April of that year the sugar stocks in the United Kingdom represented only enough for four days consumption. The food controller impressed on the public the need to reduce their sugar consumption

(1) BEVERIDGE, *Op. cit.*, pp. 91-94.
(2) *Ibidem, Op. cit.*, pp. 120-128.

voluntarily to ¾ lb. a week at the most, but an ever increasing part of the population found it impossible to buy regularly as much as that and later, when the voluntary ration was further reduced to 1/2 lb. a week they found it difficult even to obtain that quantity. Towards the end of the year 1917, however, the situation improved when food imports were given more effective priority in tonnage and when, in order to avoid competition in buying among the Allies, an International Sugar Committee was established which arranged for the purchase of the entire Cuba crop for 1917-18 and allocated it to America and to the European Allies.

The imports of *bacon, ham* and *lard*, to give a further example, also presented, in the first months after having been brought under Government control in August 1917, serious difficulties, first of a financial nature, the dollars needed for purchase being all urgently required for other purposes, and then, when these difficulties had been overcome, in the shape of heavy lossess in pork through submarine warfare and railway congestion in America, that for a considerable time blockaded enormous quantities of purchased bacon in U. S. A. and Canada. In February, 1918, these difficulties also disappeared however, and a new obstacle of quite another nature arose: the difficulty of scraping together from all quarters the shipping space necessary for the transport to Europe of the immense flood of ham and bacon which was turned out by the United States farmers as a consequence of the American price policy referred to above and which in a few months began to outrun consumption in the United Kingdom to such an extent that the rationing of these two foodstuffs could already be abolished from the end of July, 1918. At that date the stocks of bacon and ham had risen to 108,000 tons from only 5000 tons on the first of March.

As an example of successful management of a difficult supply problem it may be of interest to point out in this connection that, though the handling of such an unprecedented mass of pig products gave rise to many complaints, the claims made and approved to the trade for heated and tainted pieces of bacon represented, acording to an official statement in November, 1918, approximately only 1/4 per cent. of the total deliveries and that of this small proportion probably not more than 15 per cent. were in such a state as being unfit for human consumption (1).

The obstacles mentioned above were, however, not the only ones that confronted the Ministry of Food in its efforts to maintain the food imports. Great anxiety was also caused on several occasions by the import difficulties for frozen meat, oils and fats, tea, dried fruits, etc., but space will not allow us to give any further details. As regards the financial aspect of the import problem, it should in this connection only be added that the Ministry of Food in one essential respect found itself in a very favourable position. In dealing with the overseas producers it possessed naturally a very great bargaining power, being a single buyer of

(1) BEVERIDGE, *Op. cit.*, pp. 129-133.

immense quantities in markets often with abundant supplies, and having either virtual control of the shipping or arrangements with the friendly governments in the exporting countries for prohibiting export to destinations other than Great Britain. For all purchases in the United States, Great Britain like the other Allies had to pay, it is true, the prices fixed by the American Food Controller, but though these prices often very high, they were the same as those which the American military and naval departments had to pay. The primary task of the American Food Controller was to increase production and secure an abundance of supplies, aims that he did not dare to risk by a too rigid control of prices.

C. — Efforts to increase the home-grown food supply: obstacles and achievements.

The efforts of the Board of Agriculture and the local Agricultural Executive Committees working under it to increase the home production of foodstuffs had to cope with great difficulties of various kinds—lack of labour, lack of horses, machines, implements, lack of fertilizers and feedingstuffs, etc.—but in spite of all these drawbacks, British agriculture succeeded, as will be shown below, to a much larger extent than in pre-war years, to contribute to the covering of the food requirements of the nation.

Supply of labour, machines and implements. — The shortage of male agricultural labourers, the number of which already in January 1917, when the food production campaign began, had fallen from 800,000 in 1914 to 562,000 was, however, as far as possible made good by the release of soldiers for short periods when the call for labour was greatest, the employment of prisoners of war, by the formation of corps of schoolboys for harvest work and not least, by the assistance of women. The employment for part or whole time of the women resident in villages who had largely ceased to work on the land, was revived with the result that over a quarter of a million were at work in 1918 against less than 100,000 before the war. Large camps were also formed of women college students for labour in the harvests of 1917 and 1918, and in 1917 was organized the Women's Land Army, that provided for the farm work a large mobile force—for the harvest of 1918 for instance 16,000—of especially trained women labourers from social strata, which did not usually furnish land workers.

In those parts of the country where the programme of the ploughing up of grassland went beyond the power of the draught animals owned by the farmers themselves, gangs of teams were formed under the guidance of the local agricultural committees, which for that purpose had been authorized to purchase 30,000 horses. As, however, enough skilled ploughmen were not available, only about 20,000 horses could be procured, of which at the end of 1918 half the number worked under the orders of the Board of Agriculture and the other half had been lent to farmers.

Nor was it possible to furnish to agriculture according to plan, all the tractors, steamploughs, binders, threshing-machines, etc., but under the prevailing conditions the results achieved were not bad. As to tractors for instance, a perfect novelty to most farmers at that epoch, the Board of Agriculture thus at the end of 1918 operated 4200 of them by ploughmen engaged by itself, whereas further 3000 had been sold to farmers from the supplies ordered by the Board. Altogether were in the year 1918 650,000 acres ploughed up and 580,000 acres cultivated by the tractors working directly under the control of the Board (1).

Supply of fertilizers. — As regards the supply of fertilizers, farmers, for the first two agricultural years of the war, could be provided at reasonable prices, save in the case of potash for the supply of which the United Kingdom was wholly dependent on Germany, with practically all the artificial manures they were prepared to purchase, and first in 1916-17 the situation became serious when also the supply of phosphate had considerably shrunk owing to transport difficulties and labour shortage. In 1917-18, however, thanks to the energetic activity of the Board of Agriculture a very essential improvement took place and at the disposal of the farmers for the harvest of 1918 was put a fully sufficient supply of nitrogen in the shape of sulphate of ammonia—a large Government purchase of nitrate of soda in Chile could not be moved and had eventually to be resold—and a satisfactory supply of superphosphate. Only the supply of potash remained wholly inadequate. Attempts to relieve the shortage by imports from Abessinia stranded on shipment difficulties and the arrangements made by the Ministry of Munitions to extract potash from flue dust did not make available but very small quantities in comparison with the requirements.

With little success met too, owing to labour shortage, the efforts to increase during the war the quantity of lime applied to the land, a measure from which, could it have been carried out, one would have had reason to expect a not unimportant increase in the output of cereals, the abandonment by most British farmers of the old practice of systematic liming being held to be one of the factors responsible for the small increase in the yield per acre of cereal crops during the past century.

In this connection it should finally also be of interest to mention the initiation during the war of the investigations of Rothamsted on the preparation, without the intervention of cattle, of synthetic farm yard manure from the large surplus of straw provided by the extended war cereal growing, investigations, it is true, which remained without any immediate influence on the success of the war food campaign, but which ultimately showed such preparation to be possible at no great cost (2).

(1) MIDDLETON, *Op. cit.*, pp. 138, 186, 231; AGRICULTURE, *Encyclopedia Britannica, Op. cit.*, p. 80.

(2) *Ibidem.*, pp. 111, 145, 153, 186-187, 228, 287-288; *Agriculture*, Encyclopedia Britannica, *Op, cit.*, p. 81.

Supply of feeding stuffs. — Financial and above all shipping difficulties made quite impossible during the last war years to maintain the pre-war supply of feeding stuffs. Whereas thus this supply annually amounted to about 11 million tons, of which 3 ½ million tons of oats went to working horses and 7 ½ tons to the feeding of other livestock, agriculture could in 1917-18 owing to reduced imports and closer milling, be furnished with but a total amount of 7 million tons of which, as before the war, 3 ½ million tons were made up of oats entirely reserved for working horses, leaving less than half of the pre-war quantity for the feeding of cattle, pigs and fowl, or more precisely, for milch cows and breeding stock, little or none being assigned for the fattening of cattle and pigs (1).

To the many efforts made for instance in Germany to find substitutes for the diminished supply of feedingstuffs, no parallel is found in Great Britain. Certain investigations were no doubt carried out as to the possibilities of the method then used in Germany for preparing a digestible feed from straw, but as it was found that the actual need of feeding stuffs was not enough urgent to justify the cost of the factories required for its manufacture, the results of the investigations were never put into practice during the war (2).

War-time achievements in arable farming. — Thanks to the measures mentioned for the supply of labour, machines, fertilizers, etc., but above all no doubt to the guarantee of favourable cereal and potato minimum prices, introduced in spring, 1917, by the Corn Production Act, the efforts to extend arable farming met in spite of all difficulties with a considerable success, thereby materially contributing to the satisfactory settlement of the British war food supply problem. After a survey of the whole Kingdom carried out by the local agricultural committees and after taking into consideration the area which had been converted in the various counties from arable into grassland since 1872, the existing proportion of arable, the labour still upon the land, etc., there was fixed for each country a quota, which then again was divided among districts and eventually parishes and individual farms, orders to plough up certain fields being sent to the occupiers. These " ploughing orders " no doubt in many cases excited a violent but mostly, it seems, ill founded opposition both of occupiers and owners, many of whom still lively remembered the great depression for arable farming of 1880-1900, but on the whole the programme was adhered to and we find how between 1916 and 1918 permanent grass land to a great extent was ploughed up and the use of arable land for rotation grasses and clover reduced, thus increasing the total arable land of the United Kingdom by 1,720,000 acres and the land under tillage crops by about 23 per cent. or nearly 3,000,000 acres, the area in wheat for instance being raised by about 37 per cent. or 750,000 acres, the area in oats by about 37 per cent. or 1 ½ million acres, and the area in potatoes by about 35 per cent. or nearly 400,000 acres. There was also a minor in-

(1) STARLING, E. H.: The Feeding of Nations. London, 1919, p. 109.
(2) MIDDLETON, *Op. cit.*, p. 288.

crease in the area sown to barley. As at the same time the crop yield per acre of both cereals and potatoes in spite of wheather conditions adverse to arable cultivation, showed both in 1917 and 1918 results considerably above those in 1916, the total wheat crop increased between that year and 1918 by no less than 64 per cent., the oat crop by about 50 per cent., the barley crop by 22 per cent. and the potato by about 40 per cent. [1]

Progress of the allotment movement. — Speaking of the efforts to extend arable farming, mention should also be made of the achievements of the allotment garden movement, which no doubt considerably contributed too to the satisfactory solution of the British war food problem. Encouraged by a special regulation under the Defense of the Realm Act, by which urban authorities were empowered to prepare the allotment land for cultivation, to supply seed, manures, implements, etc. at cost price, to take possession for allotment purposes of privatly owned unoccupied land without the consent of the owner, and private occupied and common land under certain conditions, the total number of allotments had in 1918 increased to about 1,400,000, of which about 830,000 had come into existence since the outbreak of the war. For England and Wales alone the actual amount of food furnished by the allotments has been estimated at not less than 800,000 tons in 1918 [2].

Influence of war conditions on live stock and output of animal products. — With the reduction of the area under grass and above all the restricted amount of feeding stuffs there was naturally, on the other hand, no question of maintaining the home produced supplies of foodstuffs of animal origin: the annual milk production for instance thus fell from 8622 million litres in 1909-13 to 6848 millions in 1918, the output of beef and mutton in the same period from one million to about 830,000 tons [3]. British farming succeeded however in coming out of the war with a live stock, substantially reduced in numbers only in regard to pigs, the head of which between June 1914 and June 1918 had fallen by nearly 30 per cent. or from 3.95 to 2.92 millions [4]. In the same period the number of sheep had on the other hand fallen only by 3 per cent. and the number of horses and cattle somewhat increased (by 4 and 1 per cent. respectively). When the Armistice came and feedingstuffs could immediately be brought in to the starving livestock, the bringing through the war of the stock without serious losses in number proved no doubt a great benefit to the British farmer. The phenomenon, however—though, as things went, it did not have any disastrous consequences on the food supply of the country—was certainly not, from the point of view of public interest, an unconditioned advantage, as it was, admittedly, in

(1) MIDDLETON, pp. 312-315.

(2) *Ibidem*, *Op. cit.*, pp. 163, 180; *Agriculture*, Encyclopaedia Britannica, *Op. cit.*, pp. 81-82.

(3) *Ibidem*, *Op. cit.*, pp. 244, 321.

(4) *Ibidem*, p. 317.

part made possible only by withholding, contrary to Government regulations, foodstuffs useful for human consumption, a temptation that for the British farmer, just as well as for his fellow farmer on the continent in war-time, was not always easy to withstand when stock was profitable and the customary feeding-stuffs not to be had.

The net gain of the food production campaign. — What was, however, the ultimate result of the measures which were initiated at the beginning of 1917 to increase the home-produced food supply but which only in 1918 became fully effective? Was there any substantial gain? No doubt there was. If we ask what contribution would the output of 1918 have made to the nation's food supply, if the produce had been available under the normal conditions of 1913, it will be found, according to the estimates of MIDDLETON, that the net gain which the country secured from the produce of the harvest of 1918 amounted to 4,050,000 million calories corresponding to 24 per cent. of the total average annually produced by the home soil in 1913, which again furnished 16,872,000 million calories or 34 per cent. of all imported and homegrown food energy. As the total average food supply from imports and home produce for the pre-war five-year period 1909-1913 was 49,430,000 million calories the country, in other words, began the war with supplies provided by its own soil which would have sufficed for 125 days out of the 365, but secured in 1918 a harvest that would have sufficed for another month or for altogether 155 days out of the 365 (1).

It should, however, be observed that this extra month's supply which the harvest in 1918 represented if it had been utilized in the same way as in the pre-war years, falls far short of the total quantity of human food that it could have furnished if the war had been prolonged and compelled the British people to stretch its resources to the uttermost. If, as MIDDLETON points out, an amount of oats, corresponding to the pre-war oat-crop, had been reserved for stock-feed, but all other grain closely milled and used for bread and all potatoes reserved for human food, the United Kingdom could from the cereals and potatoes furnished by the 1918 crop have obtained a quantity of food equivalent for forty weeks consumption of breadstuffs; and by slaughtering the live stock the additional foods required by the population during this period would have been procurable (2).

The share of the price policy in the success of the food production campaign. — It was, however, not only the success of the ploughing up policy that essentially must be attributed to one for the farmers favourable price policy. The success on the whole of the British food production campaign must to a great extent be referred to the liberal way in which the prices were fixed by the Government also on the other farm products subject to control, *i. e.*, besides grain and potatoes, live stock, cheese, butter, eggs, fruit, certain vegetables, wool and hay. Though

(1) MIDDLETON. *Op. cit.*, p. 319-22.
(2) *Ibidem*, p. 323.

the price fixing machinery certainly did not always work smoothly—so, for instance, not in the autumn of 1917 in regard to live stock and potatoes—and the prices by no means always, were fixed on such a parity as to make unremunerative the trespassing of the feeding regulations, the price fixing was on the other hand, generally speaking carried out with the most anxious consideration for the producers interests, and though the Food Controller was empowered to fix for agricultural products whatever prices he chose and to enforce the price by requisition, they were practically always agreed upon by the official representatives of agriculture as being reasonable under the circumstances. The British farmer was in fact, says MIDDLETON, " treated by the Orders of the Food Controler in a way that must have aroused envy in the enemy countries " (1). The British food control authorities were however also, it must be remembered, in a better position than the food authorities in other countries, for those agricultural products, the maximum production of which they were anxious to secure, to offer prices with a very generous margin over and above the production costs. This was, from the point of view of the Treasury, a generosity that paid. Even if very high, yet these prices were less high than those it had to pay for the same products in any accessible foreign market and for which besides it had to suffer all the anxiety about tonnage and exchange.

D. — Measures for a more economic utilization of agricultural produce and for a fair distribution of the food supply.

In order to ascertain that the restricted food supply would be utilized, from a physiologic point of view, in the most ecónomic way and equitably distributed among the various social classes, in the main the same kind of measures were undertaken in the United Kingdom as in most other belligerent and non-belligerent countries in Europe, *i. e.* brewing and distilling was restricted, the percentage of extraction by the milling of bread-grain reduced, the feeding to live stock of cereals prohibited or limited, wholesale and retail maximum prices and individual rationing of foodstuffs introduced, etc.

Restriction of brewing and distilling. — With the end in view to reduce the imports of barley and sugar, thus at the same time saving both tonnage and food, brewing was in 1916 restricted to 70 per cent. of the output in the year ending September 1914, a measure by which it was estimated that about 150,000 tons of imported material could be saved annually. Very soon, however, the dangerous situation brought about by the submarine warfare made necessary further restrictions. In February 1917, malting of barley was stopped altogether except under licence and in April the same year it was decided to requisition all barley stocks and to reduce brewing to but 28 per cent. of the pre-war manufacture. Simultaneously distilling of spirits was also prohibited without special

(1) MIDDLETON, p. 202.

permission, which later on was even wholly withdrawn, distilling, except for yeast and spirits for munition purposes, being stopped altogether.

The decision mentioned above to reduce brewing to about 28 per cent. of the pre-war manufacture of beer was, however, never achieved. During the last three quarters of 1917 and the whole of 1918, after a certain relaxation of the restrictions, the actual brewing amounted to 38 per cent. of the pre-war figure or to an annual average of 14 against 36 million standard barrels (*i. e.* about 23 and 59 million hectolitres respectively) (1).

Milling and flour regulations. — The first step aiming at a more economic utilization of the bread grain was taken when in November of 1916 the percentage of extraction in the milling process was set up from 70 to 76 per cent. Later the percentage was further increased, reaching its maximum in March and April 1918 with 92 per cent. and then slightly falling to remain at about 87-88 per cent. till the end of the hostilities (2).

The lengthening of the extraction of the milling of wheat was, however, not enough sufficiently to eke out the supply of flour for bread making. Flour of other cereals as well as, at certain periods, of beans and potatoes had to be admixtured and but for the armistice, the bread of 1919 would no doubt to a very great extent had consisted of potatoes. As regards the admixture of other cereals, this amounted on an average in October 1917 to 9 per cent., reached its maximum in June 1918 with 32.6 per cent. and was in November 1918 14 per cent. (3).

Feedingstuff regulations. — All farm animals without exception being wasteful converters of energy—a good cow or pig for instance, the two most remunerative converters, returning as food but 15-20 per cent. of the energy present in the fodder, a full grown fattened bullock slaughtered at three years of age but 5-6 per cent.—it is evident that by the reduction of the supply of feeding stuffs pointed out above, it became a primary concern also for the British food control authorities to restrict the use of grain for stockfeed. Exclusively for human consumption were thus reserved all sound millable wheat, rye and barley and most of the maize. For animal feed was of cereal and cereal products left only the oats, any spoilt grain that might be available, the bran derived from the milling of barley and but a fraction of the wheat bran that in normal times were used for live stock, the rate of extraction having been, as pointed out above, gradually raised from about 70 to about 90 per cent. In addition only a certain amount of oil cake was obtained from the crushing of oil seeds imported for the margarine industry. Besides, it should remembered that, as already mentioned, oats were reserved entirely for working horses and the other available feedingstuffs practically wholly for milch cows and breeding stock.

(1) BEVERIDGE, *Op. cit.*, pp. 100-102.

(2) *Ibidem*, pp. 95, 98.

(3) *Ibidem*, pp. 98-99, 375.

That these feeding restrictions hovewer, were not always in practice whole heartedly adhered to, has already been pointed out. Owing to the liberal price policy of the Government described above and the fact that the food shortage never became so pressing in the United Kingdom as in the majority of the continental countries, it is, however, very probable that among the British farmers the illicit trading in farm products and offences against feeding regulations were less prevalent than among the farmers in other countries.

Price fixing. — In its task to fix the prices on home-grown foodstuffs in the stages from producer to consumer in such a way as to stimulate the production by high prices and at the same time, in the interest of a fair and equitable distribution, to give due regard to the middleman's allowances and the consumer's claim for reasonable retail prices, the Ministry of Food succeeded however on the whole remarkably well not only, as pointed out above, to satisfy the demand of the agricultural population for remuneration prices on essential farm products. The middleman—the food manufacturer and trader—who all by a licence system were made the agents in commission of the Ministry of Food, for all essential foodstuffs imported or home produced, were, not less well treated by the food authorities in the question of price fixing. After conferences with the parties concerned, costing investigations of the accounts of selected businesses performed by the costing department of the Ministry, the profit margins were, in principle, always fixed in such a way as to permit the trader to retain his pre-war income, taking into account the reduced turnover but not the diminished value of money. When there was any doubt as to their fairness, margins were not allowed to err on the side of deficiency, a rule which no doubt meant larger than normal profits for the more efficient traders but which, on the other hand, secured the ready cooperation of the whole trade and diminished the risk of distribution breaking down.

Also to the consumer, to whom certainly a well functioning distribution apparatus is a not less essential utility than to producers and middlemen, this generosity towards the trade in the fixing of prices and profits implied thus no mean advantage, even if because of that he had to pay a higher price for certain commodities. The retail maximum prices fixed for all essential foodstuffs were, however, on the whole, as will be shown later, well within the reach also of the poor strata of the population. Especially was this the case in regard to the price of the most important item in the bill of fare of the great mass of the people, the bread, the price of which, in order to allow a free and unhampered consumption thereof, was materially reduced below production costs and the loss to the producers covered by the so-called bread subsidy paid by the Treasury. This measure did no doubt cost the Government about 50 million pounds annually, a sum however that by no means could be considered a pure loss to the State, which, having become, directly or indirectly, the employer of nearly all its citizens, would have been forced materially to raise the wages, had it not been for the subsidy [1].

[1] BEVERIDGE, *Op. cit.*, pp. 108-109.

Food rationing. — Food rationing as a means to ascertain a fair and equitable distribution of the restricted food supply among all the citizens presented itself, as already pointed out in the introduction, only as late as the end of 1917 as an urgent necessity in the United Kingdom. At that epoch the havoc wrought by the submarine warfare combined with the demands of the fighting forces had so seriously diminished the tonnage to be had for imports of food, that in case of such important commodities as butter, margarine, bacon, sugar and tea, the available supplies did not allow the retailers to meet their customers demands. From all industrial districts serious and growing discontent was reported. In October 1917 the food queues made their first appearance and in January, to the shortage mentioned above of some essential imported products, was added with catastrophic suddenness also a very serious shortage of home-grown meat, on which the civilian population was practically wholly dependent for its meat supply.

To remedy the situation the Local Food Control Committees were by a special order of the Ministry of Food on 22nd December, empowered to introduce local rationing schemes, as to the form of which a wide discretion was left to the Committees, the only limiting conditions being that every scheme should be approved by the Food Controller before it could get legal effect and that the weekly per capita allowances of certain foods might not exceed the maxima prescribed by the Food Controller.

The local rationing schemes developed rapidly and they soon covered the greater part of the country meeting practically everywhere with an unqualified success. In London, for instance, where a local rationing scheme for butter,

TABLE II. — *Weekly rations received per capita in United Kingdom at the outset of rationing and at the end of the war* (1).

	Ontset of rationing grams	End of the War grams
Sugar	226	226
Butter and margarine	113	170
Lard	57	57
Butcher's meat (uncooked) (2)	452	427
Bacon and ham	113	452
Other meat	(3) —	(3) —
Jam and marmalade	113	113
Tea	(4) 57	(4) 57
Cheese	(5) —	(5) —

(1) Figures converted from ounces into grams.

(2) The rations represent the amount of meat with average quantity of bone which on the two dates could be obtained with the coupon entitling the customer to so many pennyworths of this food. The purchase of more or less expensive cuts entitled the customer to respectively smaller or larger quantities.

(3) Weekly rations ranged at the outset from 71 g. of cooked bacon or ham without bone to 355 g of any kind of poultry. At the end of the war there could be had, per capita and per week, 795 g. of horseflesh for instance, and a still larger quantity of poultry.

(4) According to most local schemes; rations were sometimes less.

(5) Cheese was not nationally but only locally rationed with rations varying from place to place.

margarine and meat was introduced on February 25th, 1918, and where during the preceding two months the food queues had attained gigantic proportions—about 500,000 were counted by the police standing in them every Saturday, and another 1,000,000 on the other days of the week—the number of persons in queues fell in the first week of the rationing to about 200,000 and in the fourth they practically vanished, thus clearly demonstrating that they were a phenomenon caused by lack of organization in face of a shortage of supplies and abolished by organization and not by increase in total supplies.

Except for sugar, which was nationally rationed as from Ist January 1918, it was however, not before July 14th 1918, after a consolidation of all the various local schemes. that the people of the United Kingdom came under a general system of food rationing, national in extent and uniformity, but administered by autonomous local committees. Relatively very few were also, as will be seen from the table below indicating the rations received per week and per capita at the outset of the local rationing and at the end of the war, the commodities which it had been found necessary to make subject to rationing. The list embraced only sugar, butter and margarine, meat, bacon and ham, jam and marmalade, tea and cheese, the two latter commodities being only locally, not nationally, rationed.

As to the quantities of the various foodstuffs furnished by the rations the comment will in the main be postponed to the following chapter, and here we shall only touch briefly upon the question of supplementary rations to self-suppliers and to certain other categories of consumers. In respect of beef and mutton self-suppliers were granted no advantage but were for instance given 50 per cent. increase of ration in respect of butter, 100 per cent. increase in respect of the first pig and 50 per cent. in respect of other pigs killed in the year, with offal and lard ration free. Rabbits were also made ration free to self-suppliers. Any elaborate administrative machinery to control or enforce the rationing of the products mentioned against self-supplyers was, however, never set up. They were considered as persons on voluntary rations and no prosecution because of an offence against this part of the rationing scheme seems ever to have been recorded.

As to the differentiation of rations according to age and occupation, the only distinction in this respect referred to meat and bacon, children under ten (later six) years of age receiving only half rations of meat and adolescent boys, as well as persons engaged in bodily labour being entitled during some months in 1918 to supplementary rations of bacon [1].

E. — Result of the food supply policy as shown by statistical data on consumption and rationing and by other statistical evidence.

So far we have only pointed out how, by changing the nature of the food imports, the detrimental effects of its shrinkage were largely counterbalanced, how the favourable harvests of 1917 and 1918 made a considerable contribution

(1) BEVERIDGE, *Op. cit.*, pp. 195-228.

to the feeding of the nation and how it was tried by various measures to achieve a fair and equitable distribution of the restricted food supply. There remains, however, to be answered the question how ultimately, thanks to all these combined efforts, the British people was actually fed in the war years, how far, in other words, the available supply sufficed to cover its food requirements, and which were the most important changes in its consumption habits. The answer is partly given in the statistics of consumption as they are set out in the following table showing the quantities of the principal foods consumed and the calorie value of all foods consumed in the United Kingdom per consumption unit in the five-year period 1909-1913 and in each year from 1914 to 1918 [1].

TABLE III. — *Quantities consumed of principal foods and calorie value of all foods consumed in the United Kingsdom in 1909-13 and in each year from 1914 to 1918.* [1]

	1909–13	1914	1915	1916	1917	1918
Flour	332	329	325	339	368	376
Butcher's meat	158	153	150	142	130	99
Bacon and ham	27	27	32	34	29	36
Butter	24	23	21	18	15	13
Margarine	9	10	15	20	19	18
Lard	9	9	10	9	6	13
Sugar	113	115	123	95	78	72
Potatoes	285	332	348	319	301	411
Fresh milk	332	335	335	310	284	247
Calories (all foodstuffs)	3,442	3,454	3,551	3,418	3,320	3,358

[1] The figures of the source giving the consumption in lbs per week have here been converted into grams per day.

We turn first our attention to the part played by the various foodstuffs in the diet of the British people before and during the war. As already pointed out *flour* and *bread* in Great Britain were never rationed. When, in the spring of 1917, the food authorities contemplated such a measure the Royal Society (War) Committee submitted to them an urgent protest pointing out that an unlimited supply of a cheap form of energy had to be provided if the working efficiency of the civil population was to be maintained. However much it was found

[1] BEVERIDGE, *Op. cit.*, pp. 311, 313, 363. — It will be observed that the figures in the table refer, not to the domestic rations but to the total consumption in all forms, including food taken in restaurants and hotels, as well as food consumed in manufactured forms, such as sugar in biscuits, chocolates, etc. It should further be noted that the data relate to quantities consumed by both civilians and by military and naval forces stationed in the United Kingdom and in its home waters and that no allowance has been made for waste or losses in distribution. To obtain the rate of consumption for the civilian population exclusively a deduction of approximately 1 per cent. should be made from the quantities given in the table.

necessary to restrict the consumption of meat, eggs, milk, butter and other important foods, bread and flour would have to be left out of a rationing scheme as long as possible [1] The Government followed this advice and, later on, in September, 1917, even induced the consumers to increase their usual consumption of bread by artificially lowering its price by means of the Government subsidy mentioned above. The result of such a policy is clearly seen in the table. Whereas the consumption per day and per consumption unit of flour in 1909-1913 amounted to 332 grams, the corresponding figure in 1918 had risen to 376 grams, a quantity which, if entirely used in bread-making, would have corresponded to about half a kilogram of bread per day. As regards the quality of the bread produced during the last war years in the United Kingdom, it no doubt gave rise to many complaints to begin with, but as soon as the bakers had learnt rationally to deal with war flour, the complaints ceased.

In the consumption of *butcher's meat* there was, as will be seen, a steady decline from 158 grams per day and per consumption unit in 1909-13 to 99 grams in 1918, a decline due partly to the reduction in the fodder supply mentioned above for the herds in the home country, partly to the reduction in the imports of frozen and chilled meat which in pre-war years formed about 40 per cent. of the total meat supply in the United Kingdom and which at that time went principally to London and other large cities, while the country districts depended almost exclusively on home-killed supplies [2]. During the war comparatively little of the imported frozen meat (10 %), however, was consumed by the civil population, most of it being intended for the feeding of the troops; but, though much reduced in quantity, it came nevertheless to play a very important part under the rationing scheme. It constituted an elastic reserve which could be used to meet emergencies and smooth out irregularities which owing to weather conditions, the amount of fodder available, etc., were an inevitable feature of the home supply. It was in fact the existence of the frozen meat reserve that insured in the United Kingdom a far better working of the meat rationing than in the Continental countries. The reduced amount of butcher's meat available per capita of population did perhaps, after the introduction of meat rationing in 1918, represent an inconvenience for the well-to-do classes, but hardly so for the poorer classes, who probably got even more meat than before the war, thanks partly to the rationing system for butcher's meat that fixed the rations by value and not directly by weight or quantity and which represented an ingenious solution of the difficulty of distributing equitably a foodstuff differing in value from cut to cut. Each coupon in respect of butcher's meat on the rationing card, in other words, entitled the customer to buy so many pennyworths of butcher's meat, and he could, as he felt inclined, spend his money and his

(1) DRUMOND, J. C. and WILBRAHAM, A.: The Englishman's Food. A History of Five Centuries of English diet. London 1939, p. 522.

(2) LLOYD, E. M. H.: Experiments in State Control. At the War Office and the Ministry of Food, London, 1924, pp. 198-199.

coupons on, for instance, a small piece of an expensive cut or on a comparatively large amount of bone and scrapings. At the outset of the rationing scheme, the weekly allowance per capita was three coupons at 5 pence each, representing together 450 grams of butcher's meat with the average quantity of bone. The value of the coupons and the amount of meat to be had from them were changed on several occasions (¹).

As regards the meat rationing it should further be mentioned that the definition of a coupon's worth by value applied only to the uncooked butcher's meat and offals; when used in the purchase of bacon or ham, poultry, game, horseflesh, sausages, cooked or tinned meat, etc., the coupon represented a weight set out in an elaborate « table of equivalents » (²).

The average consumption of *bacon* and *ham* stood, as will be seen, in all the war years above the pre-war figure and amounted in 1918 to 36 grams per day and per consumption unit against 27 in 1909-13, *i. e.*, an increase of 33 per cent. We have already pointed out the reasons for the large increase in the supply of bacon and ham taking place in 1918, an increase which made it possible to raise the weekly amount per capita of the national rationing scheme from 14 grams at the outset to 226,283 and 453 grams, with supplementary rations for certain categories of consumers and a complete abolition of rationing as from August, 1918. As to the quality of the American bacon no doubt there was much grumbling among the British consumers, it being of a type not appealing to the English taste, but though not very highly appreciated this bacon saved an awkward situation when the meat ration was reduced by force of circumstances.

As regards *butter* consumption, between the pre-war years and 1918, there was a reduction of nearly half or, from 24 to 13 grams per day and per consumption unit; little wonder, considering the steady decline in imports from about 200,000 tons in 1913 to about 80,000, and the much reduced home production as a consequence of the curtailed supply of concentrated feeds, and not least, the policy adopted by the Government which aimed at encouraging the conversion of surplus milk into cheese rather than butter and had therefore fixed the maximum price of home-produced butter below the parity of milk and cheese prices.

The shortage in butter, however, as will be seen from the table, was fully compensated, from a quantitative point of view, by the increase in the consumption of *margarine* and *lard* and these three fats together in 1918 made up practically the same weight as before the war. One of the most difficult food supply probems, which faced the belligerent nations, namely the provision of sufficient fats for the population, was thus successfully solved. Qualitatively,

(¹) BEVERIDGE, *Op. cit.*, p. 210.

(²) *Ibidem*, p. 211.

however, there was undoubtedly, through the reduction of the supply of butter, which besides was often unavailable, the ration being made up of margarine, a deterioration in the fat consumed, margarine and lard not being as good sources as butter of certain vitamins essential for growth and health. At that time one was, however, unaware of this fact. Nor, from the point of view of savouriness, was margarine a fair equivalent for butter, but it should be observed that, though the first war-time margarines produced in Great Britain were by no means attractive products, manufacturers not being able as they liked to select oils suitable for its manufacture, the quality (in course of time) improved (1).

When rationed, the weekly ration per capita of lard amounted to 57 grams and, at the outset, 113 grams altogether of butter and margarine, a quantity which later, in June, 1918 was increased to 170 grams.

The *sugar* consumption, which in 1914 and 1915 was even higher than in previous years, dropped in the following war years down to 72 grams per capita and per day against 113 grams in 1909-13. The quantity of sugar which the customer could buy with his ration card in 1918 was however, as may be expected, considerably less. It amounted, calculated per day and per consumption unit, to but 32 grams.

Of the last mentioned staples given in the table, *potatoes* and *fresh milk*, both entirely supplied by domestic production, potatoes during all the war years showed a consumption superior to that of the previous years. Particularly abundant was the potato consumption in 1918, over 400 grams per day and per consumption unit, an amount 44 per cent. above the average pre-war consumption. Good weather conditions and guaranteed prices had, as already pointed out, worked wonders, and produced a glut, which caused the Food Administration great difficulty in dealing satisfactorily with it, but which to the consumer in a besieged country was a great blessing. Potatoes were never rationed during the war, no more than any other vegetable or fruit.

In the consumption of *fresh milk*, between 1909-13 and 1918, there was a fall of 25 per cent. and during the winter of 1917 and 1918 the shortage gave cause for great anxiety. To meet this difficulty, measures were taken towards the end of the war by a special Milk Distribution Order to regulate purchases and sales and to oblige any producer or dealer to sell or deliver milk to any person or place. As a consequence, a system of wholesale rationing was introduced by which each retailer was assured of his fair proportion of the available milk supplied. Uniform individual rationing throughout the country, on the other hand, was not introduced. Measures were taken only to give priority to the more essential requirements of infants, expectant mothers, invalids, etc. and to restrict the less essential needs of the ordinary customers, hotels and restaurants,

(1) *Lloyd, Op. cit.*, p. 230.

etc. By these means, in spite of the shortage of milk during the winters of 1917-1918, and 1918-19, all priority demands were met without difficulty and the distribution to ordinary customers could be regulated fairly evenly ([1]).

As regards the milk consumption it should also be pointed out that the difficulties arising from the decrease in the supply of fresh milk could, to no small extent, be met by the increased supply of condensed milk, home-produced and especially imported.

Concerning other less important foodstuffs not included in the table, representing but about 10 per cent. of the total energy intake, it should be mentioned in conclusion that during the latter years of the war the consumption of *eggs*, for instance, fell considerably, that the consumption of *cheese*, which was locally but not nationally rationed, was reduced comparatively little, that the consumption of *fruit*, both fresh and preserved, was substantially lowered but that, on the other hand, the pre-war consumption of *vegetables* other than potatoes, thanks not in the least to the supply from the 830,000 allotments created during the war, was on the whole maintained and of *peas* and *beans* in 1918 double the average consumed in 1909-13. It should also be mentioned that the supply per inhabitant of *cocoa*, *tea* and *coffee* was larger in 1918 than in the pre-war period.

As to the reduction in fruit consumption it is not without interest to observe that the official attitude of the Government concerned, according to which oranges, lemons, apples, etc. were dispensable luxuries, not entitled to any part of the restricted shipping space, was emphatically opposed by the Royal Society Food (War) Committee and that, had it not been for that opposition, there would no doubt have been a much greater reduction in fruit consumption in the latter years of the war. It had just begun to dawn on the medical authorities that a lack of 'essential subtle principles' in the diet—the word 'vitamin' had at that time not become generally adopted—could result in serious harm to the health of people ([2]).

To sum up, we have seen from our study of the items included in table III, that in 1918, for instance, compared with the pre-war years, there was a material increase in the consumption of flour (bread), bacon and ham, margarine, lard and potatoes and, on the other hand, a fall in the consumption of meat, butter, sugar and milk. But how did these changes in the composition of the dietary of the British people influence the energy value daily furnished by the food intake during the various years of the war? During the war, in other words, did the consumer on the whole get enough to eat to cover his bodily requirements in calories? To judge from the data on the total energy furnished by all foodstuffs, it seems so. It will be observed that even in the worst of the war years the energy supplied per day and per consumption unit was above the standard requirement of 3000-3300 daily calories set to-day by most nutrition experts for

([1]) LLOYD, *Op. cit.*,

([2]) DRUMMOND, *Op. cit.*, p. 519.

an adult man effecting moderate manual work and that, compared with the pre-war level, there was a fall in the calory intake in 1917 and 1918 of only 3 and 2 ½ per cent. respectively.

In judging, from an energy standpoint, the adequacy of the food supply during the war years, it should naturally not be forgotten that, as more people undertook physical work in the war period, the normal life requirements no doubt were increased; it has been estimated that in a belligerent nation the total increase in the energy required for the reason mentioned amounts to about 5-10 per cent. On the other hand, however, it should not be forgotten that this increase in the demand for food energy to a great extent was undoubtedly and perhaps completely counterbalanced by the fact that, through the stress of circumstances, in war-time there was certainly much less waste of food in the households and that, with a properly operating rationing and price-fixing system, there was a more equal distribution among the different social classes, less over-eating among the well-to-do, less privations among the poor. There is, therefore, reason to believe that the 3350 calories per man per day furnished by the food supply in 1918 corresponded as well to the food requirements of the British nation as the supply of 3440 calories during the period 1909-13.

As to *protein* there can be little doubt that the pronouncement of the famous physician BAYLISS " take care of the calories, and the proteins will take care of themselves", holds good and that therefore the requirements of the British people in the war years of this food constituent were on the whole fully covered. The supply of bacon and ham, butter, margarine, lard furnished undoubtedly a sufficient amount of *fat* though, as already pointed out, from a qualitative point of view, owing to the reduction in the butter supply, the intake was less satisfactory than in 1913. As to *vitamins* the supply of vitamin B_1 was certainly considerably improved during the war owing to the more closely milled wheat used in breadmaking, whereas the reduction in the butter supply naturally meant a reduction in the supply of vitamin A. The reduction in the intake of vitamin *C* caused by the reduced supply of fresh fruit was probably made up to no small extent by the increased consumption of potatoes, a fairly good source of this vitamin.

While thus, as we have seen, the energy supply during the whole war was maintained near the pre-war level though with important changes in quality, this, it should be observed, was not done even in the last year at the expense of food reserves in stock, as will be seen from the table below, which gives the actual stocks of all the principal foods on September 1, 1914 and indicates as percentages thereof the stocks on the same date in the following years of the war (1).

For nearly all the most important groups of foods the stocks in 1918 were, as will be seen, higher than in 1914 and generally also the highest recorded in the table. Most remarkable were the increases in the stocks of bacon, hams, lard, cheese and sugar. It is interesting to observe the rise in most stocks from 1914 to 1915, a proof that the slogan ' Business as usual' was not merely an illusion in

(1) BEVERIDGE, *Op. cit.*, p. 319.

TABLE IV. — *Stocks of principal foods in United Kingdom on 1st September 1914 and index numbers (1 September 1914 = 100) showing the stand of stocks on the same date in the years 1915-1918*

Foods	1914 in thousand tons	Number-index			
		1915	1916	1917	1918
Wheat (including flour as wheat)	2,684-0	103	97	123	127
Barley	1,750.0	74	84	82	83
Oats	2,764.0	112	107	126	150
Bacon and ham	12.0	315	313	245	782
Other meat	76.1	113	56	92	117
All meat	*88.1*	*141*	*91*	*113*	*208*
Butter	16.9	77	60	81	94
Margarine	2.8	154	129	243	68
Lard	8.2	284	206	330	294
All fats	*27.9*	*146*	*110*	*171*	*150*
Cheese	12.9	152	113	122	98
Condensed milk	...	...	...	—	(1) —
Sugar	131.0	113	105	138	324
Tea	36.2	111	120	58	124
Cocoa	14.4	142	330	410	98
Oil-seeds	329.0	84	128	107	69
Oil cakes and meat	133.0	76	95	98	56

(1) Stocks of condensed milk did not appear before 1918, when they amounted to 29.8 thousand tons.

the early period of the war when the submarine peril had not yet taken the serious character as it did later. The British blockade, which cut off many overseas supplies from their normal markets in the European continent, and the steadily rising prices made it advantageous for the British tradesmen to buy and to hold large stocks.

One other aspect of the British food supply problem during the 1914-18 war remains, however, to be dealt with before we can know how far the British food policy succeeded in its task of feeding the people. From the data given in Table VI we have seen, it is true, that on an average for the whole population of the United Kingdom the energy supply per day and per consumption unit was entirely sufficient and that also in certain other respects the food consumption could bear comparison with the pre-war years. But was this true also for the less well-to-do strata of the population? It seems so. From the family budget data published by the Working Class Cost of Living Committee, 1918, some of which have been collected in the table below, it will be seen, it is true, that there took place between 1914 and 1918, a slight fall of 3 per cent. in the average energy value furnished by the food consumed in the various categories of working class families—skilled, semi-skilled, unskilled—and a somewhat larger decrease in the energy

supply of skilled labourers, but on the other hand there is also to be noticed a certain improvement in the calorie intake in the families of unskilled workmen (¹). To judge from the data given in the table the diet no doubt, too, in some respects deteriorated from a qualitative point of view—reduction in the butter consumption, etc.—but it is also evident that there took place in certain other respects a qualitative improvement, owing, for instance, to the increase in the consumption of milk, of whole meal bread, etc.

Thanks to the achievements of the food policy in regard to rationing, price control and supplies and, not least, the higher and more regular earnings received by the working classes through the disappearance of unemployment, it seems thus, generally speaking, highly probable, that the working classes were during the last year of the war in a position to purchase food of substantially the same nutritive value as in 1914 and that, in regard to unskilled workers families, the food intake was slightly better in 1918 than before the war in spite of the rise in the cost of food. " This conclusion", says the Committee, " is more than confirmed by the reports we have obtained from Medical Officers to the Education Authorities in the great cities. From London it is officially reported, after inspection of all the children entering school, that ' the percentage of children found in poorly nourished condition is considerably less than half the percentage in 1913. A similar improvement is shown by the figures furnished by Birmingham, Bolton, Bradford, Bristol, Glasgow and Nottingham. The general impression especially

TABLE V. — *Consumption per day and consumption unit of various important foodstuffs in working class families in Great Britain in July 1914 and June 1918* (¹).

Foodstuffs		July 1914	June 1918
Bread and flour	grams	475	490
Potatoes	»	221	284
Sugar	»	84	40
Milk fresh	litres	0,16	0,21
Cheese	grams	12	6
Eggs	numbers	0,4	0,3
Meat, sausages	grams	97	62
Bacon	»	17	36
Lard, suet, etc.	»	14	11
Butter	»	24	11
Margarine	»	6	13
Amont of energy supplied per day and consumption unit by all foodstuffs	calories	3130	3040

(¹) The figures of the source giving the consumption in lbs (pints) per week, have here been converted into grams (litres) per day.

(¹) WORKING CLASSES COST OF LIVING COMMITTEE, 1918: Report of the Committee appointed to enquire into and report on the actual increase since June, 1914, on the cost of living to the working classes, etc., London, 1918, p. 18.

of the poorer children, is favourable. And the view that parents are now better able to give their children the necessary food is borne out by the information we have received as to the number of meals provided to 'necessitous children' by the local education authorities. It is only in very exceptional cases that education authorities are supplying anything like as many meals as before the war; in most places the number has fallen to about a half (Nottingham, Stoke, and Sheffield) and a quarter (London and Bolton); and in some places (as in Birmingham and Liverpool) it is hardly necessary to provide meals at all. The last available figures for England and Wales, those for 1917, compared with the estimated number of 1914, show a decline by about four fifths in the country as a whole" (1).

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(1) THE WORKING CLASS COST OF LIVING COMMITTEE, 1918, *Op. cit.*, p. 9.

(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice montlhy); bimestr. (every two months); déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular); mens. (monthly); n°. (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

N. B. — Between brackets [/] are given translations and explanatory notes not appearing in the title of the periodical.

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Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY BULLETIN

OF

AGRICULTURAL ECONOMICS AND SOCIOLOGY

COLLECTIVE CO-PARTNERSHIP CONTRACTS IN ITALIAN AGRICULTURE

by Dr. G. COSTANZO

SUMMARY: I. The problem of day-labourers in agriculture. — II. Basic types of co-partnership in agriculture: *A*) *Individual co-partnership*. *B*) *Collective co-partnership*. — III. Economic and social results of collective co-partnership. — IV. Conclusions.

I. — The problem of day-labourers in agriculture.

The inauguration of the "wheat campaign" in 1925, gradually transformed into a comprehensive action for the intensification of agriculture as a whole, and the adoption in 1928 of the plan for land reclamation (*bonifica integrale*), led not only to a stricter application in Italy of modern technical methods in agriculture, but also to a radical re-orientation of agricultural policy and, among other changes, in particular to a modification in the theoretical and practical approach to the problem of the relations between ownership, management and labour. It was, indeed, impossible so to increase production as to keep pace with the growing food requirements of the country and to give the maximum encouragement to the initiative and energy of labour without first solving the basic problem, of a fairer distribution of agricultural income among the classes contributing to its creation. Hence the origin of the movement for the revision of agricultural contracts, the object of which was, in substance, to improve the relationship between the farmer and the worker. It was not a matter of merely solving a problem of fair distribution, however, but of so improving the situation as regards employment and remuneration of labour as to promote an increase in labour efficiency and in production. For this reason, ever since the outset of the wheat campaign the human factor has formed the object of constantly increasing attention on the part of the authorities, and the idea of an improvement in general conditions has continued to gain ground. In other words, the necessity was realized for securing in agriculture a closer and more efficient co-operation between the classes concerned in production, *i. e.*, between the farmer, the worker and the technical expert. The system of syndicates introduced in 1926 and, to a greater degree, the corporative system, founded on the Labour Charter (1927), the National Council of Corporations (1930) and the corporations

(1934), introduced the new system of planned economy which led to a reorganization of production and marketing. In this way, the criteria which up till then had governed the distributive process were gradually altered, the interest of the individual in the management of an undertaking becoming increasingly co-ordinated with the collective interest, and the social aspect of the problem of agricultural organization being stressed.

In this complex work of the revision of relations between the classes sharing in production and of the readjustment of the nation's economy undertaken for the purpose of attaining the maximum possible degree of self-sufficiency in the country's food requirements, it became apparent that one particular agricultural problem, namely that of the day-labourer, required urgent solution.

The term day-labourer (*bracciante*) in Italy is applied to that heterogeneous mass of anonymous and wandering workers, paid by the day or by the hour, the most representative group of which consists of casual or day workers who, as a rule being landless, live only on the wages earned on some farm or other, according as the need presents itself. This category includes also smallholders, leaseholders and small tenant farmers working the land themselves, who are not in a position fully to employ all their working capacity on their holdings or whose farms do not ensure the necessary livelihood for their families. Casual labour for agriculture is also supplied, especially during periods when there is a large and urgent demand for well-paid labour, by persons belonging to rural families who are normally engaged in other occupations. Lastly, the mass of casual labour is often increased, temporarily, when agricultural employment is easier to obtain, by workers belonging to other categories, of no fixed occupation, these workers belonging both to industry and agriculture; these categories, living on the margins of agricultural and industrial employment, are found mainly in the towns (pavers, diggers, bricklayers, etc.); they have much in common with casual labourers, sharing with them much of the work called *terrazzeria* (navvywork) in land reclamation, roadbuilding, etc.

The principal characteristics of casual farm labour are the following (1): *a*) occasional employment as regards time; *b*) constant shifting from one farm to another; *c*) fixed wages by time or by job.

Casual labourers pass through periods of even intense employment and periods of absolute unemployment, according to the pressure of farm work. Typical spheres of casual labour are to be found in regions where large farms run by owners or capitalist tenants predominate as they require hired labour, either permanent or casual. These conditions are found throughout most of the middle valley of the Po.

The fact that they pass continually from one farm to another, or, in other words, the lack of continuity in the relations between the person operating the

(1) Prof. ALDO PAGANI: I braccianti della Valle Padana. Osservatorio di economia agraria per l'Emilia. Istituto Nazionale di Economia Agraria. Studi e monografie, n. 15. Rome, 1932.

farm and the workers, prevents this category from forming any attachment to the land. As a matter of fact, it may always be observed that the casual labourer is absolutely disinterested in the fate of the farm on which he is temporarily employed and has only a very slight knowledge of its organization and requirements. This often leads to unsatisfactory work and involves the necessity of much supervision and a search for a form of remuneration and for contractual clauses which guarantee the quantity and quality of work desired.

From the characteristics of casual labour as described above it will be seen that the situation of these workers and the earnings on which their budget is based are extremely unstable. Their life is always very hard and uncertain and is combined with exceptional discomforts, one of the most serious being undoubtedly that of migration from one part of the country to another. On the other hand, the reluctance of day labourers in Emilia to emigrate abroad added another complication to an already delicate situation. It should be added that their occupation being almost entirely seasonal and complementary, these workers are typically subject to unemployment in the real sense of the term. The scanty employment of causal labourers may be said to constitute one of their chronic and constitutional diseases. Even during periods when economic conditions were not unfavourable, they have often been reduced, in some regions, to an average of 150-100 working days a year, creating an absurd situation in which the farmers complained that wages were too high and that they were therefore compelled to reduce the quantity of labour employed, while, at the same time, workers were asking for another increase because they could not live working only 100 days a year.

In some years the pressure on agriculture by the mass of casual labourers in search of work assumed extremely serious forms. It may be recalled, in fact, that during the three-year period 1919-1921 the strong tide in favour of class organization and strikes caused an upheaval in Italian rural districts. In 1920 over one and a half million farm workers were grouped in class organizations; there were 189 strikes that year, with over a million strikers and a loss of some 14 million working days.

In Emilia, where the demand for labour, already very high at the time of the Jacini agrarian survey (1880), increased steadily, casual labourers invented special forms of class defence (¹). They began by fighting the exchange of work arranged between the farms operated by *mezzadria*, as these exchanges destroyed their possibility of obtaining employment; they favoured the so-called *stralci di terra*, or the expropriation of strips of land from farms considered too large for the working capacity of the family of settlers, as in this way they themselves could obtain more land to work upon. The owner class reacted against this ac-

(¹) See in A. SERPIERI: L'agricoltura nell'economia della Nazione (Corso di economia e politica agraria, Tomo II), Chapter VI: « Il processo distributivo nell'agricoltura: l'autodifesa di classe dei lavoratori agricoli ». Florence, 1940.

tion by the farm workers, an original form of which was the organization of "collective leases", by reducing labour-intensive crops, by increasing the use of machinery, by giving up certain works of minor importance because they were no longer worth while owing to high wages. All this aggravated unemployment among casual labourers.

Working by shifts was introduced to mitigate loss due to unemployment and, after the war, recourse was made to the so-called *imponibile di mano d'opera*, which consisted in compelling the farmers to employ a minimum number of casual workers per hectare.

From the above it will be seen that the problems connected with the category of casual labourers are very complex and, above all, that the quality of the work provided by this class no longer meets the needs of the corporative system, which presupposes the ordered and efficient operation of the various elements of production. Arrigo Serpieri justly remarks that "an intensive agriculture, suitably organized, especially if based on produce excelling in quality rather than in mass, especially if it excludes the predominant use of machinery for physical reasons (configuration of the land, etc.) or for social reasons (great density of population), cannot be built on casual labour, disinterested in the results of production, extraneous to the productive organization, with no stable attachment to the land". Thus it came about that, as the population gradually increased, finding no outlet in emigration, while the progress made in certain branches of industry required a steadily increasing amount of raw material of agricultural origin, it became evident that a more intensive and rational cultivation of the land was necessary, while the problem of the gradual elimination of casual labourers and of their transformation into workers with a direct interest in the agricultural undertaking and partially responsible for the results obtained, assumed decisive importance. On the other hand, it forms a part of the vast programme in favour of the improvement of the social position of farm workers which has in recent years been given a concrete form increasingly adapted to the new conditions of the nation's economy.

The first instructions concerning the action called *sbracciantizzazione*, which envisaged various measures intended at dealing with the problem of casual labour, were issued in March, 1930. After an examination of the situation of casual labourers in the Valley of the Po, it was declared necessary, in order to lighten the pressure they were exercising upon agriculture: 1) that day labourers' families, preference being given to peasants formerly *métayers*, ex-owners or ex-tenants, be settled on newly-reclaimed land in central or southern Italy, or on the islands; 2) that the new farm units in the reclaimed areas of the Po Valley be allotted to day labourers' families; 3) that, whenever possible or suitable, the *stralcio* or expropriation of land be effected or a share-cropping contract be concluded in order to offer normal work and certain earnings to day labourers' families; 4) that their migrations within the country be organized on a wider scale; 5) that a minimum of labour be made compulsory wherever it may appear rationally possible and economically useful; 6) that in the drawing up of collective contracts due account be taken not only of the wage factor, but above all of the continuity of employment.

When it met in May, 1930, the Corporation of Agriculture was charged with the practical execution of the decisions mentioned above. It asserted that in the social structure the day labourer represents an element rather of disruption and restlessness than of cohesion and stability; the need was then reasserted for binding the worker permanently to the land, giving him a share in the productive activity; the principle was also maintained that the land must be given the maximum capacity of absorption of labour by means of an intensification of cultivation and of suitable land improvements.

It soon appeared, however, that the solution of a problem affecting so large a mass of workers could not be found in partial and sporadic provisions, but that it called for the organization of agriculture which would make it possible to reduce casual labour to a minimum and regulate the length of the employment period on farms. In other words, the worker employed occasionally or permanently but receiving a fixed wage, was to be transformed into a worker permanently bound to the land and paid by means of a share in the produce. This line of thought was put into effect through an agreement between the two national Agricultural Confederations of employers and workers, dated October 25, 1934. Under the terms of the agreement instructions were given for the orientation of direct farm operation, based essentially on the employment of fixed or casual labour, towards a gradual transformation into general, family or collective co-partnership, reducing the number of day labourers to a minimum. This agreement, moreover, eliminated the characteristic of compulsion from the old system of the minimum number of labourers (*imponibile*) giving the system a more rational form consisting in the determination, farm by farm, of the actual labour requirement, below which the farm operator may under no circumstances reduce the number of his workers.

The basic idea is the following: each well operated farm must utilize a given number of working days annually in relation to the various crops grown, in order to guarantee the execution of all the necessary field work during each season. The degree of "activity" on a farm, namely, the amount of human labour employed annually per hectare, assumes even greater importance, as is well-known, when considered from the social aspect; it indicates, as a matter of fact, the number of workers who can find permanent employment on the farm, the number of persons or families who can bind themselves to the land with lasting ties. Obviously, when there is too high a pressure of population on a relatively small area of land, preference and encouragement must be given to active and intensive types of agriculture capable of offering employment to a larger number of workers and obtaining from the land more abundant produce.

Since this is the situation in Italy, the reasons of the favour obtained in this country by the system of collective co-partnership in the operation of farms are clear. This system was widely applied in the two large agricultural areas of Mantua and Maccarese (Rome). It may be considered as one of the first stages through which the wage-earner must pass in the course of his rise to a higher social stratum.

II. — Basic types of co-partnership in agriculture.

The system of co-partnership has been long and widely practised in Italian agriculture in its individual form. Obviously, however, in the past the idea of improving the output by giving labour an interest in the results of the undertaking, an idea which has gained ground steadily with the passage of time, did not exist; still less was there any idea that the wages of labour should be adjusted to the needs of the workers and to the concrete possibilities of the undertakings, a principle which is characteristic of the corporative system.

A special survey was carried out, on the initiative of the National Institute of Agricultural Economics, concerning co-partnership in Campania and Lucania (1). In dealing with the general aspect of this contractual relationship, the report on the survey points out that its characteristic feature does not consist merely in substituting, in whole or in part, the worker's wages, as expressed by a given amount of money or of commodities, with a share of the produce obtained; because co-partnership is also distinguished by the following features: *a*) the various ways in which the worker takes part in the functions of the farmer as entrepreneur and in providing the working capital of the farm; *b*) the stable and lasting nature of the relations instead of the passing and uncertain nature of relations between the worker and a given farm; *c*) the independence instead of a lack of independence of the undertaking; *d*) complex and highly developed organization of the farm instead of a simple and primitive organization; *e*) the certainty instead of uncertainty of the returns obtained by the worker, high, adequate or inadequate for his support; *f*) the standard of living, consequently, high instead of low and a peaceful, instead of worried life for the worker.

The remuneration of the worker in co-partnership – according to Prof. A. Brizi – is a mixture of several elements: *a*) wages in the strict sense of the term, in so far as the co-partner is a labourer; *b*) profit, in so far as he is associated with the farmer or the owner of the land, sharing with him the risk of production; *c*) interest on working capital, in so far as he often supplies some of such capital.

The relationship of co-partnership is found in Italian agriculture (2) either as an accessory to the wage-earner's contract, or as an independent contract, or else as a collateral to other contracts (*métayage*, etc.), to which it constitutes a necessary supplementary agreement.

Two basic types of co-partnership may be distinguished, one being simple or individual and the other collective.

(1) Prof. ALESSANDRO BRIZI: Compartecipazioni agrarie e contadini partecipanti in Campania e in Lucania. Istituto Nazionale di Economia Agraria. Osservatorio di economia agraria di Portici (Napoli), Rome, 1935.

(2) ANTONIO ZAPPI RECORDATI: Delimitazioni delle varie forme di compartecipazione in atto nella agricoltura italiana. In *Atti della R. Accademia dei Georgofili*. April-June, 1941-XIX. Florence.

A) *Individual co-partnership.*

Individual co-partnership, the first to originate in point of time, is regulated in its broad lines, by provincial collective contracts and finds its source, in single concrete cases, in a special contract under which the farmer cedes to the worker an allotment of land, usually already prepared for sowing, with the engagement that he will cultivate it and with an agreement to share the produce and the expenses under given conditions. The contract affects only some of the crops produced on the farm; in the case of the others, the relations between the undertaking and labour are those of a fixed or casual wage-earner or even, in some of the Southern Italian regions, of a small tenant.

This system is widespread throughout all the farms on the reclaimed areas in Venetia and Emilia, the workers in co-partnership being casual labourers, as well as in some of the regions of Southern Italy, especially in the *latifundia* areas; it is also fairly common on the farms employing hired labour in Lombardy and Piedmont.

The crops most frequently grown under this system are: wheat, hemp, beets, tobacco, maize, tomatoes, potatoes in Northern Italy and wheat, beans, maize in Southern Italy.

The contract lasts generally from the time of sowing to the first handling of the product; the farmer takes care of the preparation of the ground until sowing as well as of transport; the worker supplies all the labour necessary for the crop, from sowings to the first handling of the crop. Sometimes, however, the contract begins even before sowings and, again, in the case of some crops, the co-partnership expires before the product has been handled at all.

The worker is entitled to a share in the crop varying between 30 and 40 per cent.; the same percentage applies to the outlay for the purchase of manures and seeds, for the hire of certain equipment, etc. These expenses are, however, paid in advance by the farmer, who is also obliged to advance to the worker during the vegetative period of the crop the sums of money necessary for the maintenance of his family, reimbursing himself at harvest-time. Apart from these basic agreements, there are others concerning by-products, which vary from one province to another.

In some provinces, especially in Ferrara, for instance, a clause guaranteeing a minimum quantity of the product is coming into common use.

Individual co-partnership, very useful for permanent hired labour, because it allows the worker to use his spare time for other work, as well as for the labour of women and boys, is all the more useful for casual labour, whose possibility of employment is notoriously precarious.

From our point of view however, collective co-partnership presents much greater interest, and on this subject we will dwell at greater length.

B) *Collective co-partnership* (1).

Collective co-partnership is regulated by a national standard contract signed between the Confederation of Agriculturists and the Confederation of Agricultural Workers on June 27, 1937. This contract contains a preamble in which its purpose, namely, the reduction of casual labour, is clearly emphasized, and it asserts that this object may be attained solely by binding the worker to the land and assigning him a share in the productive process; the contract also states that one of the most suitable means of arriving at the end in view consists in the transformation of the form of direct operation of the farms, employing casual labour, into the form under which the labour employed has a share in the product. Collective co-partnership is defined as a system based on a community of interest extended to the various crops produced on the farm and on a discipline under which workers "collectively liable and responsible", on the one hand and the farmer, on the other hand, share in the expenses and the profits of the management, according to quotas to be fixed in the special contracts signed by the particular farms.

In order to give the most complete picture possible of the features of this new system of farm operation, a description of each of its basic elements is given below.

Forms of collective co-partnership. — Collective co-partnership may assume two different forms: general and partial. The former is found when the collectivity of workers takes part in all the productive activities of the farm; the latter is found when the co-partnership does not include fodder crops, animal husbandry and other crops for which the farmer provides separately.

Recruting of workers for co-partnership. — Workers to be assumed in co-partnership are chosen individually by the employer, who takes care, as he goes along, to select those most suitable from the standpoint of working capacity and moral qualities. In this way a methodical selection from the ranks of casual labour is made, with the object of forming a select class of farm workers. The workers are taken on, as a rule, in family groups and in exceptional cases, as individuals. The family's labour worth is estimated by the number of working units of which it is composed. The number of workers in co-partnership is determined strictly in accordance with the requirements of the farm, in order to allow, on the one hand, the rational and economical cultivation of the land and, on the other, the greatest possible absorption of labour. This number is determined by the farmer and the co-partners through their respective syndical organizations.

(1) A. PAGANI: Le compartecipazioni agricole del Mantovano. Milan, 1933. — A. ADMI: Dalla scomparsa del salariato alla compartecipazione. Mantua, 1934. — G. PESCE: La compartecipazione collettiva nell'azienda agraria. Rome, anno XIV. — A. DE FEO: La natura giuridica della compartecipazione in agricoltura. Confederazione Fascista degli Agricoltori. Rome, 1939.

When there is agricultural unemployment and a consequent need to ensure a greater absorption of labour, the number of workers may be increased by a certain percentage of working units to an extent, however, which guarantees each worker a subsistance minimum. This brings about the adoption of fixed turns of labour. Whenever it may prove necessary to give employment to a larger number of workers in order to provide a wider distribution of earnings, a selection will be made, as an emergency measure, of one working unit from each family of farm workers living in the community.

Management of the farm. — The management of the farm depends exclusively on the farmer who is responsible for the efficient operation of the holding. The farmer may manage the farm either directly or through a manager appointed by him, always conforming to the recognized criteria of agricultural technique. It is considered advisable that the farmer should own the farm, as this ensures his being directly concerned in maintaining the farm at the height of efficiency.

In exercising his directive functions, the farmer profits, in a spirit of collaboration, from the experience of the "foremen", among the workers, with the double object of guaranteeing the successful working of the co-partnership and of preparing the workers for positions of greater responsibility.

Organization of the representation of the colletivity of the workers. — When the contracts are drawn up for each farm the workers select some of their number known for their technical capacity and moral standing; these men are appointed to represent the workers and to fill the functions belonging to the head of the family under the *métayage* system. The men selected are given the title, mentioned above, of "foremen". Over and above the functions already described their duties include also: *a*) the signing of the co-partnership contract with the farmer, on behalf of the workers; *b*) the keeping of co-partnership accounts and of the individual work books up-to-date, filling in the hours of work and overtime performed by each worker daily; *c*) providing, jointly with the farmer, for the closing of the final co-partnership accounts; *d*) providing for the control and distribution of the individual shares; *e*) attending to the technical training of the workers and helping them in the carrying-out of their work.

The "foremen" are not exempt from work, nor have they the right to special payment; at the end of the agricultural year, however, a recompense may be awarded them by agreement among the workers and this sum must be debited to the total of the workers', share in the receipts of the farm.

Relations between the contracting parties. — The owner or operator of the farm must provide:

a) the land prepared and adapted for rational cultivation and, as a rule, supplied with hygienic buildings, suitable as dwellings for the workers in co-partnership, who pay no rent; the workers have also the right to an allotment of land to be cultivated on their own account as a kitchen garden, as well as to a poultry-run and pig-stye; indeed, if the workers are to become attached to the land, an essential condition is that they should be able to live on the farm itself and to use

its annexes; in cases where houses for workers are lacking and the workers have to live outside the farm, account must be taken of this deficiency when fixing the distribution of shares in the products;

b) live and dead stock;

c) machinery and equipment;

d) working capital.

The workers, in their turn, must provide:

a) all the work necessary for the operation of the farm;

b) small hand tools for common use;

c) their allotted share in the working capital, in so far, namely, as concerns their appointed share in the cost of seeds, manures, anticryptogamic material, etc.

When the workers have no tools, the farmer purchases them, debiting the outlay to the worker.

Advances. — During the agricultural year the operator advances, weekly or monthly, to each worker, certain sums of money or supplies in kind, in order to enable the workers to live during the year, as, in their quality of casual labour, they have no supplies; the amount of these advances may not be less than 70 per cent. of the corresponding annual wage of a casual or hired labourer and constitutes in each case a minimum retribution guaranteed to the workers in co-partnership for their work.

Liabilities of the contracting parties. — The liabilities of the contracting parties are strictly defined, namely: the operator must maintain the farm in full productive efficiency, advance the necessary means for its operation, repair the machinery and tools, pay the taxes, rates and various payments as well as the insurance premiums not considered as expenses to be paid in common by the operator and the workers; the workers must carry out all the work, both ordinary and extraordinary.

The following expenses must be borne in common by the contracting parties, according to their respective quotas in the distribution of the produce: outlay for the purchase of fuel, chemical fertilizers, anticryptogamic material, seeds, feed, etc., expenses for the veterinary care of the livestock, expenses for the ordinary maintenance of the machinery and insurance premiums for the farm products. All other expenses are charged entirely to the operator of the farm.

Distribution of the products. — The products are divided into two shares, one for the operator of the farm and the other, as a whole, for the collectivity of workers. In the distribution of the products the contracting parties must take account, on the one hand, of the normal productive capacity of the farm and, on the other, of the amount of wages which the workers can obtain on the basis of the existing tariffs, in relation to the normal quantity of work required by the farm. The share in the products to which each of the contracting parties is entitled represents the lever of the co-partnership system and must therefore be dertermined in such a way as not to cause either loss or lack of balance for one or other of the parties. The products are assessed at the prices realized by direct

sale; any products which may remain unsold are assessed on the basis of current market prices.

The aggregate workers'share in the products is divided up by the "foremen „ and the operator of the farm with the aid of the syndical associations, into individual shares which are assigned to each worker taking due account of the quantity and quality of the work done.

The constitution of reserves out of profits. — In order that the workers may gradually constitute a fund which in future may enable them to become independent farmers, provision is made that at the end of each year, in proportion to the annual return obtained, a part of the profits be set aside as a reserve; this is done for the purpose of encouraging the workers to save and to build up the funds by means of which they may gradually become owners of holdings.

The adaptation of the contract to particular cases. — The co-partnership contract is national and is at the same time adaptable to the needs of each particular farm. The collective co-partnership must be adapted, on each farm, to its particular economic conditions. The duration of the national contract is three years, while that of the separate farms last one year, both being renewable by tacit agreement.

Each collectivity of workers is provided with special farm books, general and individual, of debit and credit. The final accounts are entered in the general books which are closed at the end of each year. The general books have their counterpart in the separate family books. Each worker may therefore at any moment assess his situation as well as that of the farm.

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Provision is also made in collective co-partnership for the special development of measures of assistance and of economic and social facilities which are a special feature of the system, giving it the peculiar characteristics of a family arrangement.

In order to make full use of all the possible economic resources of the farm, provision is made, for instance, for the installation of a general kitchen garden to be used either for providing vegetables for domestic use or else for the market, thus increasing the return obtained from the farm.

Special equipment for poultry rearing is also provided for.

Moreover, in order to prevent the greater outlay connected with the ordinary organization of purchases, provision is made for the institution in each co-partnership unit of a collective store; in this store, which does not represent a commercial undertaking, but merely a means of paying wages in kind, the workers can obtain food and other necessaries, purchased directly from producers or wholesalers. The store is run by the workers themselves with the financial aid of the operator who advances the initial capital. Under this system, the cost of living is considerably lowered, while at the same time the peasants are guided back to a form of family economy.

Provision is made for medical assistance with the object not so much of curing of the sick, as of preventing the spread of diseases. A school-camp is also instituted, namely an experimental camp where the workers, with the aid of technical instruction organized by the agricultural syndicates, obtain the necessary pratical notions concerning crops and domestic economy.

Lastly, a *dopolavoro* (leasure hours' occupation) is organized in each co-partnership, including, as a rule, a reading room, wireless, and various sports and games; it serves for the amusement and instruction of the worker, binding him still more closely to the land.

III. — Economic and social results of collective co-partnership.

Having mentioned the basic types of co-partnership in Italian farming and described the main characteristic features of its collective form, a form which has originated under the corporative regime to whose basic principles it closely conforms, we will now examine the economic and social results achieved by it. For this purpose we will consider two typical cases, namely, that of the co-partnership units in the province of Mantua and that of similar units on the Maccarese Estate (Rome). In the former case, we will discuss the results obtained in the first years of their application (1), since they clearly illustrate the conditions described in the first chapter (heavy pressure on agriculture by the mass of casual labour and unemployment), conditions which constituted the principal reason for a transformation of the former system; in connection with the Maccarese co-partnership scheme, we will discuss the development of the last few years.

It should be stated that in the Mantua region most physical conditions are exceedingly varied, which also accounts for wide variations in the economic and social conditions. The moraine hills, stretching from lake Garda down towards Goito, pass to the deep, cool and fertile areas beyond the Po, and then to the large farms running along the left bank of the Mincio where rice-fields alternate with wheat and meadows. Historical reasons, the poverty of the physical characteristics of the region, traditional political strife, have given rise in this province to numerous attempts to find a solution for the social and agricultural problem; thus, the old contractual relations, individual and familiar in character, became collective labour relations, with groups of individuals having no ties of kinship. Co-partnership comes within this category.

Partial and general co-partnership, as already indicated above, were both in use in the province of Mantua. The substantial difference between these two forms lies in the fact that while the workers interested in general co-partnership obtain almost all their returns from this form of farming, the revenue obtained

(1) See in this connection A. PAGANI, *op. cit.*

from partial co-partnership, on the contrary, constitutes only a supplement to their wages. General co-partnership may apply either to a family or to a collectivity of workers; in the former case, the farm is divided into separate allotments assigned to each family; in the second case, there is usually a comprehensive contract involving the whole farm. When the contract embraces the whole farm and the co-partnership interest of the workers extends even to the fodder crops and the livestock, we have collective *mezzadria.*

Collective co-partnership contracts date from the agricultural year 1930-31, with 1 *mezzadria* and 2 co-partnership units. In 1931-32 there were already 12 co-partnerships and 9 *mezzadrie*; in 1932-33, the number of farms run on these lines rose to 57, with 40 co-partnerships and 17 *mezzadrie.* The area involved was respectively 4255.90 hectares and 1420.80, the membership of the two different groups numbering respectively 2,002 and 733. On 8 farms the labour employed increased by over 20 per cent. in comparison with the number employed under the direct form of operation.

As regards the economic results on the farms, by comparing the individual incomes received annually by the workers in co-parterships with the average estimated earnings of casual labour in the same locality, we find that on almost all the collective farms there was a difference in their favour which attained, or surpassed, in the various cases, 500 lire for the men and 200 lire for the women.

From a study of the farm budgets we find that a comparison with the average data characterizing the situation of casual workers in the locality also shows a difference in favour of collective operation, as regards, both daily wages and the number of days worked. In this connection, it should be recalled that the working day of a labourer with an interest in the results has a very different economic value and moral significance from that of a mere casual labourer.

Wages were paid for about half the amount in money, the remainder being in kind.

The value of this system for the farm operators is proved indirectly by two facts, namely by the renewals of co-partnership contracts and by the distribution of products carried out according to a procedure making it possible to pay the workers a net return almost equal to the wages they would have had as mere casual labourers.

In the course of time, co-partnership in the Mantua area progressed on a wide scale. Here the casual labour class was very numerous and consequently the basic problem lay in obtaining as even a distribution as possible of working days and available land in order that the earnings of each one should be, if not sufficient, at least fair. Although it was not possible to find employment for the whole mass of workers, which was in excess of the requirement, success was certainly obtained in so far as a high percentage of workers was provided with work; the policy adopted in that region may therefore be considered as having been successful.

This system of operation was later extended to other provinces, where moreover, only contracts of the first type (collective co-partnership) were applied. Among these, mention should be made of the provinces of Vicenza, Verona, Fer-

rara and Rome. In the last-named a contract is in course, perfected from a juridical standpoint in 1938, on the San Giorgio farm belonging to the " Maccarese " Reclamation Co. Ltd., which owns extensive agricultural equipment and has adopted an intensive and industrialized system of farming which presents the greatest interest (1). We will now describe the work of this concern.

It should be stated in the first instance that the 4,736 hectares forming the Maccarese farm before 1925, and therefore prior to the beginning of reclamation work, were partly leased and partly operated directly by the owners; the whole area was cultivated on an extremely extensive system to cereals and pasturage. The gross return on the land amounted at that time to a few hundred lire per hectare and the total average return was a little over a million lire per annum for the whole farm. The fixed population did not exceed 50 during the winter, while in the summer it was reduced to a few people.

The situation as regards population soon changed when hydraulic reclamation commenced because, according to the policy inspired by the system of comprehensive land reclamation in Italy, the agricultural reclamation of the whole district was started simultaneously. Thus the population increased gradually from year to year, and today the density of the rural population is equivalent to 108 inabitants per square kilometre of total area.

The farming system instituted by the Maccarese Reclamation Company is the following: 2,723 hectares in cereal and fodder crops; 700 hectares in vineyards; 260 hectares in market gardens; 50 hectares in nurseries; 767 hectares in woods; over 200 hectares in roads, canals, villages, farm centres, etc. Almost all the arable land, namely some 3000 hectares, is irrigated.

This farming enterprise has led to the creation of huge industrial plants, including an enological establishment with a capacity of 50,000 hectolitres, another for the selection and preservation of cereals and a centre for the collection and refrigeration of milk with a cheese factory attached.

The whole concern is divided into three sectors, each sector being subdivided into market-gardening and wine-growing farms and cereal-producing and livestock farms. The cereal-producing and livestock farms, which are 17 in number, each consist of about 150 hectares, with about 150 head of milk cows. The market-gardening and wine-growing farms, which are 5 in number, are operated on the *mezzadria* system and occupy 155 families. Two sectors (about 1,700 hectares) are operated directly, while the other, amounting to about 1000 hectares, is operated on the co-partnership system.

There are 413 workers in co-partnership, between men and women, forming 118 families. These families, assembled in groups of 17-22 members, are subdivided into 6 co-partnership units.

(1) See in this connection: the chapter on " La bonifica del Maccarese " in the volume by VINCENZO LAI: Bonifica e lavoro. Florence, 1942-XX. — CESARE GRINOVERO: Aspetti tecnico-economici del lavoro manuale in alcune compartecipazioni collettive di Maccarese S. Giorgio. Confederazione fascista dei lavoratori dell'agricoltura. Rome, 1936. — DANIELE PRINZI: Aspetti sociali della bonifica di Maccarese. *In Bonifica e Colonizzazione*, No. 11. Rome, 1941.

All the products of the co-partnership units are centralized in the Maccarese Company farm, which attends to their marketing, crediting itself at the end of the year with the relative takings entered to the general account of the co-partnership units; this amount, less collective expenses of management, is then divided at the rate of 40 per cent. to the workers and 60 per cent. to the Company. The expenses are divided at the same rate. The workers, besides their share of the cash receipts, also obtain the following supplies in kind: 180 litres of wine annually for each working unit (or, alternatively, maize for the same value); 180 litres of milk; wood to an amount of 20 quintals for the first working unit and 5 quintal for each following unit.

The workers are obliged to carry out all the field and stable work; they have also to perform any casual labour required.

The land operated under the co-partnership system is subdivided into allotments of about 150 hectares, all used for intensive cereal and fodder crops.

According to the agricultural convention referring to this farm the workers are entitled to various non-interest bearing advances, running from 24 lire to 140 lire every fortnight according to the qualifications and sex of the workers; they are, moreover, entitled, also as an advance, to 10 kg. of wheat every fortnight for every working unit; at present, under the pooling system, these advances in kind are substituted with their equivalent in cash.

Each co-partnership unit has skilled or specialised workers and a certain number of common labourers. In this case there are three "foremen" who supervise the progress of work.

The share of returns to which the workers are entitled (40 per cent.) is divided among them according to the hours of work performed by each one and according to the working units, namely according to a scale representing the work of a man between 18 and 65 years of age, which is put at 10 tenths, this basis being reduced to 7,6 and 4 tenths according to whether the workers are boys or women of varying ages.

Skilled or specialized workers enjoy a special supplement. In practice, 10 per cent. is deducted from the share to which the workers are entitled and this is divided in varying proportions among the skilled workers.

The provincial Union of agricultural workers for the province of Rome registers the data concerning this form of operation for each year. Some figures in connection with the six co-partnership units for the agricultural years 1939-40 and 1940-41 are given in p.p. 312-13. During this period these units covered a total area of 970.85 hectares and the total number of working hours for the two years was 676,234 and 662,138 respectively.

Considering that the wages per hour, on the basis of the collective labour contract for casual farm labour in the Maccarese area, is on the average about 1.76, it will be seen that for all the co-partnership units the remuneration is higher than that of the casual labourer; it should also be remembered that the families of workers in co-partnership also enjoy, according to the general system inherent to collective co-partnership, free housing and the produce of the family kitchen gardens and poultry-runs.

Situation of collective co-partnership units during

Area of co-partnership units in hectares	Total working hours		Working units		Advances					
					in cash		wheat, rice, maize		extra-contractual	
	1939-40	1940-41	1939-40	1940-41	1939-40 L.	1940-41 L.	1939-40 L.	1940-41 L. (1)	1939-40 L.	1940-41 L.
153.35 . . .	109,639	111,647	43.8	40.—	89,885	107,603	19,742	—	2,732	3,330
148.84 . . .	109,406	110,679	43.76	40.—	89,935	107,855	19,716	—	3,269	3,097
175.19 . . .	107,535	105,043	43.—	38.8	87,666	104,339	20,047	—	4,600	14,661
174.19 . . .	119,626	112,073	47.85	39.5	96,936	108,138	22,736	—	2,332	8,006
169.46 . . .	112,112	112,893	44.84	36.4	92,719	117,254	21,044	—	11,756	13,047
149.88 . . .	117,916	109,803	47.16	47.—	93,853	106,232	22,986	—	1,359	3,019

(1) After the introduction of rationing, the above were no longer distributed, and their value was added

These advantages permit the families of workers in co-partnership to effect considerable savings; in fact, 104 out of the existing 118 families saved a total of 584,500 lire during the year 1940-41, equivalent to an average saving per family of 5,620.20 lire.

The present war period has confirmed the intrinsic strength of these organizations in that they, in spite of the reductions in their staff due to numerous members being called up, have been able to maintain the farms in full efficiency.

IV. — Conclusions.

The economic and social improvement of the conditions of casual farm labour is one of the most important objects of the new Italian agricultural policy. As is well-known, the essential purpose of this policy is to attain the highest possible degree of independence of foreign markets, as regards both the principal foodstuff and the raw materials of agricultural origin required by industry. The "wheat campaign" and the comprehensive land reclamation were conceived with a view to intensifying production to the highest possible degree in order that the country's demand of agricultural products might, as far as possible, be met from domestic production. But in order to attain this result it was indispensable, as has already been said, that land systems and contractual relations in agriculture should be so organized as to secure the highest possible efficiency in the

he agricultural years 1939-40 and 1940-41.

wine, milk, wood		final balance		total		Remuneration per working unit				
						per hour				per annum
						men from 18 to 65 years	men from 15 to 18 years	women from 16 to 60 years	boys from 12 to 15 and girls from 12 to 16 years	
1939-40	1940-41	1939-40	1940-41	1939-40	1940-41					
L.	L.	L.	L.	L.	L.	L.	L.	L.	L.	L.
24,694	6,692	130,157	71,321	267,210	188,946	2.44	1.71	1.46	0.97	6,101
22,788	5,766	182,050	216,458	317,758	333,176	2.00	2.03	1.74	1.16	7,254
25,088	6,587	35,690	83,299	173,091	208,886	1.61	1.13	0.97	0.64	4,025
25,148	6,455	127,702	197,168	274,854	319,767	2.30	1.61	1.38	0.92	5,750
24,409	10,549	74,155	61,280	224,083	202,130	2.—	1.40	1.20	0.80	5,002
22,333	6,425	181,402	170,406	321,933	286,082	2.73	1.91	1.64	1.09	6,821

o cash advances.

utilisation of productive forces, of which the most important is labour. When considering the situation from this standpoint, the conditions of casual labour were immediately seen as absurd and anachronistic, as these workers had no interest in the results of production. Their gradual transformation into workers with a direct interest in the agricultural business was obviously urgent and fundamental. It was necessary to think out a form of farm organization which would call the casual labourer to co-operate in the successful working of the whole farm. This meant, among other things, that a solution had to be found for one of the most serious social problems inherited from the past. The anonymous wandering masses of workers, supplying labour of an inferior quality, not only constituted a serious loss to agriculture, but also represented a social danger, especially in those areas which are most subject to unemployment. The problem, on the other hand, was undoubtedly very complex, because the new type of contract, had to be of such a kind that it would not only bind the casual labourer permanently to the land and safeguard, at the same time, the interests of production, but also possess sufficient elasticity to absorb a greater number of hands in cases of unemployment. It would have to be applied in areas where large farms operated directly by the owner with hired labour were predominant. After studying the question from these various aspects, it was found that the system of collective co-partnership would be best suited to meet the needs of the situation. It is, in fact, characterized by the following essential features: cash wages replaced by a share in the products to be obtained; but, while the amount of wages is fixed in advance, the share

in the products assigned in a co-partnership is expressed as a fraction (1/2, 2/3, etc.) or as a percentage (33 per cent., 40 per cent., etc.), of the product to be obtained, so that the amount actually earned depends upon the results of production. The result is that the worker in co-partnership partly assumes the economic characteristics of the operator, since he shares in the risk of production. In the second place, he has a direct interest in production, which improves the quality of his work and reduces the need of supervision to a minimum. Moreover, in its various forms and environmental conditions, the co-partnership system makes it possible to adapt and to vary the clauses of the contract made with the worker, both as regards the supply of working capital (livestock, fertilizers, equipment), and as regards the rules governing collaboration in the business. The operator of the farm has the advantage, in comparison with the systems of operation with hired labour, of having to invest a smaller amount of initial capital in the farm. The worker, on his side, receiving as he does products of prime necessity for his family as remuneration for his work, is freed, at least in part, from dependence upon the market for the necessaries of life and, consequently, is not called upon to pay the full amount of the prices charged to the general consumer. For both contracting parties, too, the co-partnership system is often an advantage in that it renders them less affected by the fluctuations in the prices of agricultural products. But the social advantage of this system is perhaps even greater than the economic benefit; indeed, it prepares the worker technically for his eventual step forward on the social scale towards the higher categories of settler in the colonies, *mezzadro*, small tenant, farmer or smallholder.

Collective co-partnership, especially in its general form, is preferable to the individual type, because it increases the stability of labour and therefore of the workers' income, and makes the ties which bind him to the farm much closer.

Of course, certain conditions are necessary to make co-partnership a success. Conditions are favourable to co-partnership, above all, where many crops are grown; this is explained by the fact that a considerable amount of work has to be procured for the workers and by the obligation of guaranteeing them products in sufficient quantity for their food requirements. As a general rule, experience shows that where co-partnership is combined with intensive system of farming, the forms of the contract itself are to the general advantage both of production and of the workers' conditions. Where, on the other hand, co-partnership is combined with a poor and primitive farming system, the worker's conditions are depressed. The first type of land system would be distinguished by the following conditions: labour-intensive farming system, which comprises crops requiring much work; mixed cropping, comprising both herbaceous plants and trees, in order that the distribution of work throughout the year be uniform; a naturally fertile farm which has already reached a stage of stable agriculture, in order that its returns are not subject to excessive fluctuations and can guarantee a normal standard of living. Under these conditions co-partnership can and does give good results. Matters are different under a poor and primitive farming system, characterized by extensive methods of cultivation, by a scarcity of livestock, by poor farm housing, etc. In this case, the return for work is of necessity low and the worker's living conditions are precarious and more or less miserable. Now, since the new Italian agrarian

policy tends towards the highest general development of the productivity of agriculture, it is clear that the basic conditions for the success of the system under review are being gradually created by it. This system, whose highest and most complete expression is found in *mezzadria*, represents above all a means of realizing that idea of collaboration between the fundamental human factors of production which inspires the corporative system.

The category of casual labour seems therefore destined in Italy to be steadily reduced. The plans for comprehensive land reclamation and settlement now being put into effect in many regions are continually absorbing a considerable number and transforming them gradually into smallholders. The tendency mentioned above finds its proof, *grosso modo*, in the various censuses of the population. In this connection, several facts resulting from a comparison carried out in a recent survey (1) are very significant. This comparison between the results of the separate censuses was made only for males, on the basis of four large occupational categories, in which, after suitable adjustments had been made, the data for the various censuses taken between 1871 and 1936 were incorporated. It was thus shown that the following important changes had taken place in the composition of the agricultural population. Workers (males) who in 1871 and 1881 constituted about 60 per cent. of the agricultural population (male), represented in 1936 only 28.4 per cent. (including the mixed figures of workers and operators). On the other hand, while during the said period of time the number of workers had decreased, the number of owner-farmers had increased, the same percentages having changed from 18 to 32.9 per cent. It should be observed, in particular, that for the *coloni parziari*, who represent a relation something similar to co-partnership, the change is from 17 to 20 per cent. Moreover, the variations described did not take place steadily throughout the long period under consideration. From 1881 to 1901 a fairly sharp movement is observed towards the higher categories: a considerable decrease in labourers (from 61.2 to 46.4 per cent.) is balanced, indeed, by a considerable increase in *mezzadri* (from about 750,000 to 1,270,000: from 13.7 to 19.8 per cent.) and of farmers on their own or on leased land (in all from 1,450,000 approximately to 2,140,000: from 25.7 to 33.4 per cent.).

The data given seem therefore to indicate a tendency towards a process of " deproletariatization "of the rural population, with a decided movement towards the transformation of the mere wage-earners into tenant farmers and even into owner-farmers. But, ten years later, there seemed to have been a reaction. In 1911, in fact, we find: considerable decreases in owner-farmers, a slight decrease in *mezzadri* and an increase in labourers. After the war, on the contrary, there has been again a considerable upward movement towards ownership: owner-farmers rose between 1911 and 1921 from 1,100,000 to about 2,290,000 (from 18.3 to 32.4 per cent.). The other agricultural categories have all been reduced in

(1) A. MOLINARI: La struttura della popolazione rurale e le nuove figure agricole rilevate nell'ottavo censimento. Istituto Centrale di Statistica del Regno d'Italia. Rome, 1937.

proportion, although the number of labourers remained at 3,170,000 units (44.7 per cent.).

Under the new agricultural policy dating from 1922, the increase in owner-farmers [1], a form which represents the final phase in the rise of the agricultural worker, continues and becomes consolidated. Other radical transformations have been observed after 1931 in the lower strata of the rural population. Above all—as A. Molinari remarks in the monograph already referred to—under the strong and progressive pressure of the policy of " deproletariatization " of the rural population, the number of labourers (males) decreases from 3,170,000 in 1921 to 1,993,000 in 1931 and to 1,792,000 in 1936, or from 44.7 to 30.5 per cent. and to 28.4 per cent. of the total (male) agricultural population. The number of labourers is therefore reduced to about one quarter of the agricultural population (as against 60 per cent. in 1881). Simultaneously a considerable increase is registered in various forms of tenancy; but what interests us here is to observe that, in the group of labourers a process is in course in Italy leading to the stabilization of the worker and to the consolidation of his bonds with the land. Thus the casual labourer is being transformed into a wage-earner under a yearly contract or into a co-partner.

This process was recently recognized and encouraged officially at the meeting of the National Council of the Confederation of agricultural workers, held in April 1942, in a renewed declaration concerning the great advantages which accrue not only to the workers but also to employers and to the national economy in general from the adoption of forms which base the remuneration of the labourer's work on his sharing in the results of production.

[1] Prof. GIOVANNI LORENZONI: Relazione finale dell'inchiesta sulla piccola proprietà coltivatrice formatasi nel dopoguerra. Istituto Nazionale di Economia Agraria. Rome, 1938.

BIBLIOGRAPHY ON ECONOMIC AND SOCIOLOGICAL SUBJECTS

AUGUST LÖSCH: *Die räumliche Ordnung der Wirtschaft.* Eine Untersuchung über Standort, Wirtschaftsgebiete und internationalen Handel. Gustav Fischer, Jena, 1940. VIII-348 pp.

The book under review represents probably the most comprehensive attempt at dealing with the problem of economic location that had ever been made. We know of numerous studies dealing with one or other of the special aspects of this problem. THÜNEN'S classical " Isolated State ", followed by the works of ENGELBRECHT, SKVORTZOV and others, on the agricultural aspect of the problem, as well as LAUNHARDT'S, and especially ALFRED WEBER'S works on the economic location of industries, have all been discussing it from the point of view of a particular branch of economic activity. ANDREAS PREDÖHL, OSKAR ENGLÄNDER and HANS RITSCHL have, indeed, envisaged the problem of economic location in a comprehensive sense, involving the interrelation of all the various elements of the economic system, but though in their studies they indicated the lines of approach to the theoretical interpretation of the problem, they have not worked out its details.

Now, AUGUST LÖSCH approaches his problem in the most general and comprehensive sense as involving the interpretation of the spatial organization of the economic system. He begins with the discussion of the general theoretical basis of the problem of economic location of production and consumption, passing then to the constitution of economic regions and to the examination of the problems of international trade in their spatial aspect.

The book is largely conceived and written with laborious care of detail. It contains many highly instructive observations which undoubtedly contribute to the elucidation of many more or less obscure points of the intricate design of the spatial organization of economic activities. No one could certainly say that " it reads like a novel ", as it really makes very difficult reading and puts a great strain on the reader's power of concentration. To the reviewer it would, however, appear that it largely repays the effort it demands, mainly by the light it throws into many a dark corner of the theoretical interpretation of the problem of economic location. Indeed, the reviewer's impression is that, on the whole, in spite of the comprehensive approach to the subject which distinguishes LÖSCH'S work, the principal merit of his book consists precisely in these details and side-lights.

In the Preface to his work, LÖSCH sets himself a very ambitious task. He says: " Just as the theory of economic evolution takes into consideration the economic aspect of the factor of time, so the present work will take into consideration the economic aspect of the factor of space. And this will be done along the whole line, and not, as heretofore, only in respect of certain particular problems. Our purpose is to consider the whole economic life under its geographical aspect. In this way, it will, in principle, be possible to rewrite the whole economic theory from the point of view of space. "

Such a statement cannot help striking the economist's eye. While it is true that the problem of economic location has so far failed to find its due place in the system of theoretical economics, in which it figures largely as a stranger, being called upon to help in the building-up of the theory of rent, along with such avowedly foreign branches of knowledge as the soil science, one would be hardly prepared to see it rise from relative obscurity to so central and exalted a position. Indeed, LÖSCH, to judge from the statement just quoted, goes much further than claiming for the theory of economic location its proper place in the general system of economics. He actually pretends at rewriting economic theory on a new principle by referring economic phenomena to the factor of space, just as, according to him, the theory of economic evolution refers them to time.

Here, however, there is an obvious misunderstanding. Should LÖSCH have envisaged the construction of a theory of economic geography by finding the laws which govern the spatial distribution of economic activities over the earth's surface, his reference to the theory of economic evolution would be relevant. But the theory of economic evolution, on the one hand, and theoretical economics, on the other hand, are two subjects conceptually so different as to make such reference not only irrelevant, but

actually impossible. Not even the most out-and-out partisan of the Historical School had ever gone so far as to advocate the rewriting of economic theory from the point of view of time. Marxian economics which, among all the systems of economics, is the one most intimately linked to a definite theory of economic evolution, in spite of that is constructionally independent of the latter. And that independence is essential because of the different nature of the two subjects.

Economic theory cannot, indeed, be either written or rewritten "from the point of view of space" any more than it can be written or rewritten from the point of view of time. Both space and time exercise a certain influence upon economic phenomena, but they are essentially outside factors, whereas the constructive principle of the theory of any subject whatever must organically belong to that subject; it must be essentially endogenous and not exogenous. Economic theory is no exception to this general rule. Actually its whole structure rests upon the principle of an ideal equilibrium, towards which the economic system, under the pressure of competition, continually gravitates through the automatic adjustment of prices. And, indeed, when following the course of LÖSCH's painstaking exposition of his subject, the critical reader cannot fail to perceive that, whatever the original intentions of the author may have been, his actual contribution consists not in rewriting economics from the point of view of space, but merely in elaborating, with great care of detail, the part played by the factor of space in the traditional system of equilibrium economics.

As most of the details of LÖSCH's book have already been dealt with by other reviewers, among whom HANS RITSCHL (1) and ERICH SCHNEIDER (2), we shall not go again over the ground covered by them, concentrating our attention mainly on the agricultural aspect of the work.

The book consists of four parts, the first and the shortest of which deals with the theory of economic location proper and occupies some sixty odd pages. The second discusses economic regions. The third examines the spatial aspect of international trade. Finally, in the last the author illustrates his theoretical findings with examples drawn from life.

The theory of economic location is conceived by LÖSCH, as by most other authors, in purely mathematical terms, and both the first and the second parts of his book are largely concerned with the formulation, respectively, of the "location equations" (*Standortsgleichungen*) and of "location figures" (*Standortsfiguren*) of the theoretically constituted regions.

To what extent this method is the best one to follow in discussing the problem of economic location, is largely a question of mental habit, but the accessibility of the book to the non-mathematical majority of economists is certainly diminished by so exclusively mathematical an approach. This is all the more so that the mathematical formulation is exceedingly abstruse and complicated. It lacks that simple elegance which may render mathematical presentation, even if not absolutely necessary in expounding a theory, at least really helpful in its clear understanding. This excessive abstruseness of mathematical formulation is very much to be regretted, as it somewhat detracts from the value of an otherwise interesting and suggestive work.

In discussing the agricultural aspect of the problem of economic location, LÖSCH naturally starts from THÜNEN's scheme, about which, however, he makes the startling statement to the effect that "Thünen and his school deal with special cases" (p. 36). This is in contrast with all that has been thought so far about the "Isolated State", which has been generally believed to have laid down the general principles of the spatial organization of agriculture. A closer examination of LÖSCH's own reasoning in the pages following this statement suggests, however, the conclusion that it is rather he than THÜNEN that is dealing in casuistry. This is certainly true about the complicated demonstration, with the help of several diagrams, in which he shows how a given organization af agricultural production, in which both corn and potatoes are cultivated in conformity with the tenets of THÜNEN's scheme, is modified if potatoes, instead of

(1) « Aufgabe und Methode der Standortslehre », *Weltwirtsch. Archiv*, May 1941, p.p. 115-25, and LÖSCH's reply to it: « Um eine neue Standortstheorie. Eine Auseinandersetzung mit Ritschl », *Weltwirtsch. Archiv*, July 1941, p.p. I-II.

(2) « Der Raum in der Wirtschaftstheorie », *Jahrb. fur Nationalökonomie und Statistik*, January 1941, p.p. 727-34.

being a traditional crop, are first introduced from America, at a time when all the land in the zones nearest to market is already occupied by corn. In this case the potatoes, instead of being grown nearest to market, have to be cultivated in remoter parts, from which they spread towards the centre, until a limit is reached at which the rent per ton of potatoes will be the double but the rent per acre will equal that of corn, and equilibrium will once again be restored, though the order of zones will be reversed. Potatoes, with their larger per hectare yield and their heavier costs of production, will be grown further from the market than corn, contrary to THÜNEN'S scheme.

When agriculture is strongly bound by tradition, and its adaptation to economic influences is handicapped, the spatial distribution of farming systems is also generally different from that envisaged in THÜNEN'S scheme. As a result, LÖSCH comes to the conclusion that " in a dynamic economic system the zones of THÜNEN are bound to get formed, while in an economy ruled by tradition they may as well be reversed" (p. 48). Accordingly, to him, THÜNEN'S zones appear not as a necessary, but only as a possible principle of organization.

This attitude can hardly be accepted, because, while rejecting THÜNEN'S very clear and logical presentation of a generalized case which admits of corrections and modifications for practically every particular situation, it seeks to build upon specific or abnormal situations, such as traditions etc., which every investigation concerned with problems of location has to allow for, but upon which no constructive generalization can be based.

According to LÖSCH, " the method of THÜNEN permits only to investigate the influence of the geographical situation and to add, at the best, for consideration, a few other factors. We have only to imagine how irregularly the costs of production vary from one village to another, and even from acre to acre, to perceive that a generally applicable method for the determination of economic location is as impossible in agriculture as it is in industry" (p. 52). This being so, the reasonable course for LÖSCH would appear to be to drop the matter, or at least to confine himself to what might be called the idiographic study of his subject by considering the various particular cases and their combinations. Instead, a few pages further, we find him passing to the formulation of the " general equations of economic location" which, as he explains, must enable us to consider the factor of space in its relation to the problem of economic equilibrium (p. p. 55-56).

According to LÖSCH", we cannot any more content ourselves with the knowledge of the conditions of equilibrium in the most general sense, but we must learn how equilibrium is realized in real life. Therefore, we cannot any more dispense with the consideration of space and time. In the following pages we shall deal with the conditions of general equilibrium in relation to space". And in the following exposition we see how true, in spite of the revolutionary intentions proclaimed by him in the Preface, LÖSCH has remained to the tenets of the traditional equilibrium school in the most straightforward form given them by WALRAS and his successors.

The part dealing with economic regions begins with a detailed examination of various abstract figures of geometrically constructed regions, of which the practical value, to the reviewer at least, is far from obvious, so remote they are from reality. The most interesting chapter in this part is that dealing with the regional variations in the elasticity of demand and its relation to prices, the size of marketing regions of particular business enterprises, the various forms of dumping, the effects of tariffs etc.

In the part dealing with international trade, LÖSCH engages into a critical examination and revision of the classical theory of relative costs as the basis of the geographical distribution of various branches of production and of the international division of labour in general. He starts from the assumption that the individual's choice of the place in which he exercises his economic activity is determined not merely by considerations of monetary gain, but by the aggregate of the avantages of any kind which make him prefer one locality to another. This, according to LÖSCH, would account for the great diversity which can be observed in the profits of various businesses, as well as in wages, in the same locality, which could not be explained by the traditional theory of relative costs (p. 160). While he does not reject outright the old theory of relative costs, as an explanation of the location of various branches of production, he thinks that, not being essentially false, it has been consistently misapplied. " One *sought* to explain by it for which branch of production certain localities, regions or countries are fitted, but one *could* explain by it only what people actually produce. The principal reason why this theory cannot be applied to countries consists in the spatial extension of the latter. The theory of relative costs considers them as points and thinks that it does all that is neces-

sary, and more, if it takes into account the cost of transport between the countries concerned. But it is precisely these costs that are often practically nil, while the costs incurred in transport up to the country's frontier never are so" (p. 164). This is perfectly true, and the costs of internal transport must be taken into account in every particular case, as they naturally are by all those engaged in a detailed study of international trade in a given product in relation to the location of production. But it would be as wrong to expect a general theory to take into consideration the infinite variety of such costs according to particular locations, as it would be for the investigator of a specific problem of the location of a given branch of production to omit them. Here, again, LÖSCH's tendency to overstress particulars and special cases, so clearly apparent in his treatment of THÜNEN, is evident.

The most interesting part of the book is the last, in which LÖSCH illustrates his theoretical exposition by examples from actual live, mainly taken from the United States owing to the particular advantages that that country presents for such study. The enormous extension of the United States, its great economic, political and geographical uniformity, its lack of binding traditions and its deeply radicated belief in reason and freedom are cited by LÖSCH as the principal causes of the fact that the influence of economic forces can be discerned more clearly in the spatial distribution of economic activities there than in most other countries. It would be impossible to dwell here on the contents of this part of the book which occupies over 100 pages, with numerous illustrations. Whatever may be his attitude to the theoretical parts of the work, here the reader will find much interesting food for thought.

G. P.

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OF

AGRICULTURAL ECONOMICS AND SOCIOLOGY

SOME OBSERVATIONS CONCERNING THE SPATIAL ORGANIZATION OF AGRICULTURE

by DR. GEORGE PAVLOVSKY.

I. — Introduction.

General definitions.

The present study will deal with certain aspects of the problem of the spatial organization of agriculture.

The spatial organization of agriculture at a given stage of a country's economic and social development depends upon two sets of factors which determine the location of the different branches of agricultural production and of the different systems of farming. One of these sets comprises the natural factors, such as climate and soil, on which depends the possibility of the successful exercise in a given locality of certain branches of agriculture or of animal husbandry. Beside these natural factors of the location of agricultural production, there are the economic factors. These comprise all those factors which affect the economic position of farming in a given locality by determining the prices of farm products and the costs to the farmer of labour and of material means of production.

While the natural factors of location have, in the main, to be taken for granted, save for various technical adjustments and adaptations which, at a certain cost, permit natural obstacles to be more or less successfully overcome, the economic factors are much more accessible to the deliberate action of man. Indeed, almost at all times Governments have sought to influence the development of agriculture and industry in various localities by creating or assisting in their working certain economic factors of location, such as roads, waterways, organized local markets, supply of labour etc. Now, when, with the development of plan-

ned economy, the movement towards a deliberate rationalization of economic activities is continually gaining ground, the problem of a rational spatial organization of agriculture is naturally coming to the fore, and the essential theoretical and practical aspects of this problem have to be thoroughly studied.

Such a study cannot naturally be attempted single-handed, within the restricted space of a review article. All we can do here, is to call the reader's attention to the fundamental theoretical propositions bearing upon the problem of the spatial organization of agriculture and to the basic practical measures leading to its solution.

Our theoretical economics assume the existence of an economic system of which the prime mover is the individual human agent acting in accordance with his particular economic interests. As his profit is determined by the relation of the prices he obtains for his products on the market to the prices he pays for the goods and services he requires for carrying on his business, the working of the whole economic system ultimately depends on the complex interrelations between the prices of the various commodities and services. These interrelations within the price system are automatically adjusted by competition which keeps them in a condition of unstable balance, fluctuating about an ideal equilibrium point.

Under such conditions, which constitute the essential premises of the competitive system, the basic problem the human economic agent, as the prime mover of the whole system, has to solve, concerns the price-costs ratios ruling in his branch of production. These ratios naturally differ according to time and to space, as time brings about various changes in technique and in economic conditions affecting the prices of commodities and services, while space involves the question of the costs of transport for the products marketed and for the necessary means of production. It is, therefore, from the point of view of the influence of a given geographical situation of his business upon its price-costs ratios that, under a system depending for its working on profit, the producer naturally approaches the problem of location.

Thus, the economic problem of location appears in the first instance as a problem of private business economics. *It consists, in the manufacturing industries, in finding the geographical situation in which the factory or works would enjoy the most advantageous conditions for the marketing of its products and for the supply of labour and material means of production. In agriculture, where the geographical situation of the farm is given, it consists in finding the system of farming which would ensure the most profitable ratio between the prices of the products and the costs of production* (1).

(1) According to THEODOR BRINKMANN, " the four factors which determine the differences in intensity and the location of different systems of farming are: (1) the economic location of the farm (*Verkehrslage*); (2) the natural conditions (physical productivity) of the farm, (3) the stage of development of the social organization (*Volkswirtschaft*) and, (4) the personal qualities of the farmer " (*Economics of the Farm Business*, p. 10). To quote BRINKMANN, " the economic location of a farm includes all its relations to

As a result of the combination of the individual decisions in this respect of the persons who, in the aggregate, constitute the business community, there emerges the spatial distribution of the various branches of economic activity within the territory of a given country or region at a given moment.

When we come to envisage the general pattern of the spatial distribution of economic activities within a given community, we pass from the private aspect of the problem of location to its social or general aspect. From the domain of private business economics of the several manufacturing or farming businesses belonging to a community, we pass into the domain of the collective economic life of the community itself.

The economic problem of location in the social or collective sense involves the general consideration of the economic factors which, acting through the deliberate choice or decision of the individual producers in connection with the geographical situation of their particular economic activities, determine the spatial distribution of the various forms of economic activity within a given community.

The object pursued by the economic investigation of this problem consists in discovering the laws which govern the statics and the dynamics of the spatial organization of the economic system (¹).

The problem of economic location in the system of economics.

Location being the resultant of the combined action of all the complex of forces to which a business situated in a given locality is subject, from the point of view of general economics there can be no separate problems of location for the various branches of economic activity (²).

the outside world, active as well as passive. We have, on the one hand, the marketing location, on the other, the purchasing location. The favourableness of a farm's location can be measured by the level of the local prices (farm prices) for products of the land and by the local price level for the goods and services purchased by the farmers. The higher the prices of agricultural products and the lower the prices of purchased goods in a given place, the more favourable is its economic location" (*ibidem*, p. 11). To the four factors indicated by BRINKMANN we would suggest the addition of a fifth: the factor of population as one of decisive importance for the supply and the cost of labour.

(¹) As OSKAR ENGLÄNDER puts it, "The pure theory of location is the general theory of spatial conditioning within the national economy, and as such must explain all those phenomena which derive from the local conditions of supply and demand and are connected with the costs involved in overcoming distances" ("Kritisches und Positives zu einer allgemeinen reinen Lehre vom Standort", *Zeitschrift für Volkswirtschaft und Sozialpolitik*, N. F., V. Bd., 1926, p. 436).

(²) According to ANDREAS PREDÖHL, "the fact that only special theories of location, one bearing upon agriculture and the other upon industry, have acquired importance, should not make us forget that the special theories of location occupy a secondary place. The locations of agriculture and industry are merely sections of the comprehensive subject of the spatial division of the economic system as a whole".... "The theory of economic location must be conceived in the first instance as a theory of the spatial organization of the economic system" ("Das Standortsproblem in der Wirtschaftstheorie", *Weltwirtschaftl. Archiv*, April 1925, p. 298). OSKAR ENGLÄNDER, in speaking of ALFRED WEBER's clear-cut separation between the problems of location in industry, on the one hand, and in agriculture, on the other hand, discusses the question from the purely methodological viewpoint

If, as this has generally been done, beginning with VON THÜNEN's classical scheme, attention is focused upon the agricultural aspect of the problem of economic location, its examination always must rest on definite assumptions with regard to the other branches of economic activity, and with a clear understanding of the fact that, should these assumptions be changed, the whole spatial organization of agriculture would undergo a modification.

The position of the problem of location within the framework of theoretical economics had never been clearly defined. Even now, after over a century of recognized existence, it still remains in the position rather of an independent adjunct to theoretical economics than of an organic constituent of its system. To quote ANDREAS PREDÖHL, "the theory of location, conceived as pure theory, stands beside theoretical economics, without any apparent connection with the latter" (1).

While the special investigations concerned with the problem of location generally establish its connection with theoretical economics, more or less explicitely, through the theory of prices, the systematic treatises of economics seldom deal with location at all, except in connection with the theory of rent. As, however, in connection with this particular subject, economics has to refer not only to location, but also to the natural fertility of the soil, which avowedly belongs to another discipline, this does by no means necessarily imply an organic incorporation of the theory of location into the general body of theoretical economics.

It is true that we find a discussion of the problem of economic location, for instance, in the great treatise of ALBERT SCHÄFFLE, (2) who deals with it in some detail. But this treatise is not, in the strict sense of the word, a theoretical work, as it essentially represents a systematic exposition of social economy based upon the analogy between the social system and the living organism, which constitutes the essential characteristic of the author's approach to the interpretation of social and economic problems. His object was not that of fitting the theory of location, as an essential element in its logical scheme, into the general system of theoretical economics, but merely of assigning to the problem of location its place in the systematic exposition of economics.

Thus, the position of the problem of location within the logical scheme of theoretical economics remains uncertain. This leads sometimes to misunder-

of the formal possibilities of constructing a single theory embracing both problems by means of certain assumptions, such as that of treating land as a means of production having an infinitely great weight, etc. While we agree with his statement that "the pure theory of location does not distinguish between industry and agriculture" ("Kritisches und Positives zu einer reinen Lehre vom Standort", *Ztschr. f. Volkswirtschaft und Sozialpolitik*, 1926, p. 476) we consider the question here not from the point of view of the formal expedients of theoretical construction, but in its substance, as in real life agriculture and industry are obviously complementary.

(1) "Das Standortsproblem in der Wirtschaftstheorie", *Weltwirtschaftliches Archiv*, April 1925, pp. 295-6.

(2) ALBERT SCHÄFFLE: *Gesellschaftliches System der menschlichen Wirtschaft*, Book III, Chapter IV.

standings (¹) and points to the necessity to try and clear up our position in this respect here.

The organic bond between the theory of location and the general system of theoretical economics is constitued by the theory of the formation of prices. This connection, however, is not direct, as it is in the case of the price-building factors of collective or social nature, such as the supply and demand of commodities and of money, which constitute the basic structural elements of equilibrium economics. The theory of location deals with the formation of individual differential prices and rents essentially based upon the prices ruling on the market, as established by the usual price-building process of equilibrium economics, in which it does not directly take part. The theory of location concerns in the first instance not the social process of price formation, but the private economy of the several businesses or farms, in so far as their economic situation is affected by their position in space.

The influence exercised by location on the social process of price-building on the market is indirect. It works by reaction, through the effects upon the supply of commodities (this latter being a direct price-building factor) of changes in the economic location of producers leading to an increase or a diminution of their output and their sales. These effects can be easily realized if we imagine the changes produced by a new railway, as an economic factor of location, upon the volume of production and sales of a region which, before, did not possess modern means of communication with the market.

Thus, the theory of location is organically fitted into the general body of theoretical economics through the price theory, the formation of prices being influenced by the factor of economic location indirectly, through its action upon supply.

II. Von Thünen's theory of the spatial distribution of farming systems.

The original scheme of the "Isolated State"

The modern theory of economic location in its agricultural aspect, which involves the consideration of the economic factors of the spatial organization of agriculture, is essentially based upon JOHANN HEINRICH VON THÜNEN's clas-

(¹) As an example we may point to AUGUST LÖSCH's preface to his book *Die räumliche Ordnung der Wirtschaft*, in which he proposes to "rewrite the whole economic theory from the point of view of space", just as the theory of economic evolution is written from the point of view of time. Economic theory cannot be written from the point of view of space any more that it can be written from the point of view of time, and the analogy between economic theory and the theory of economic evolution cannot stand examination, as in the latter the element of time is essential, while in the former it is merely accidental and essentially extraneous. Though both space and time exercise an influence upon economic phenomena, they essentially belong to a domain outside economics, while the constructive principle of the theory of any subject must necessarily belong to that subject: it must be endogenous and not exogenous. Economic theory is built upon the endogenous principle of equilibrium maintained by the adjustment of prices, and factors outside the economic system can exercise their influence upon its working only through the price system, and only as factors of price formation they can be brought within the theoretical framework of economics.

sical work on the " Isolated State " published in 1826 ([1]). Changes in economic conditions have led to numerous modifications in the details of VON THÜNEN's original construction, but the principles laid down by him have seldom been challenged and may be said to be generally accepted ([2]). Accordingly, we shall briefly remind the reader of his basic propositions, in order then to pass to their applications, *mutatis mutandis*, to economic conditions profoundly changed by the development of rapid and cheap means of transport and by the consequent expansion of international trade.

VON THÜNEN's original scheme envisages the purely hypothetical case of an isolated state with a single large town situated in the centre of a uniformly fertile plain having no waterways and surrounded by a wide belt of uncultivated land which divides it from the rest of the world. The central town is the only market for the surrounding agricultural country, as well as the only source from which this latter can buy the industrial products it needs. Having thus defined the terms of his problem, VON THÜNEN asks himself " how, under such conditions, the agriculture of the country would be organized, and what would be the influence upon it of a greater or lesser distance from the town ".

According to this scheme, the intensity of farming, which depends upon the prices of farm products and their relation to the costs of production, which latter increase along with intensification, tends to diminish as the distance from the town increases. This is due to the fact that, with the increase in the distance and, consequently, in the cost of trasport, the spot prices of farm products (VON THÜNEN always speaks in this case of rye as the standard crop cultivated in the " isolated State ", just as was the case in his own Mecklenburg in his time) are reduced, while the prices of the means of production – agricultural implements, manure etc. – are increased. Thus, with the increase of the distance from the town, the price-cost ratio becomes always less and less favourable to the farmer, who is thus compelled to adopt more extensive systems of farming in order to diminish his costs of production and to adapt them to lower prices for farm products.

Accordingly, the farming systems in the " isolated State " group themselves in concentric circles about the town, five of these circles representing de-

([1]) JOHANN HEINRICH VON THÜNEN: *Der isolierte Staat in Beziehung auf Landwirschaft und Nationalökonomie.* The edition used by us is that of 1910, with an introduction of Prof. Dr. HEINRICH WAENTIG.

([2]) Probably the most thorough attempt at constructing an alternative theory, based not upon the distance from market but upon a combination of natural conditions and density of population, was made in 1890 by one of the leading Russian agricultural economists, A. I. SKVORTZOV, in his work on *The Influence of Steam Transport upon Agriculture.* His scheme, however, as justly pointed out by BORIS KNIPOVICH (in his postumous study *The Formation of Agricultural Regions*, Moscow, 1925, published by the Zemplan, pp. 134-139), is built upon a wholly different principle from that of VON THÜNEN, as he deals with the spatial distribution not of the systems of farming distinguished by their respective degrees of intensity, but of the different branches of agricultural production. While VON THÜNEN started on the assumption of all other things except the distance from market being equal, SKVORTZOV assumed as his criterion natural conditions in combination with the density of population and examined the changes in agricultural production under the exclusive influence of variations in these two factors.

creasing degrees of intensity in agricultural production and one being occupied by forestry.

The first, most intensive, zone is the one in the immediate vicinity of the town, in which prevails the system of free cropping with the production of vegetables and other relatively expensive and highly perishable commodities, and in which animal husbandry is confined to the production of fresh milk. Next comes the zone of forestry, as timber being bulky and its transport, in the absence of waterways, involving heavy costs, it has to be produced near the market. The next, third, zone, is occupied by intensive arable farming with scientific rotation, after which comes the zone of seven-course (Mecklenburg) field grass rotation, followed by the fifth zone of three-course cropping with fallow and, finally, by the sixth zone of grazing or ranching. This last zone, in VON THÜNEN's scheme, with the only exception of dairy farming in the suburban belt, is the only one in which animal husbandry can be carried on at a profit, owing to the exceedingly low costs of extensive grazing; its competition precludes livestock from being a paying proposition in any of the other zones.

By the aid of calculations based upon the experience of his own estate, Tellow, near Rostock, VON THÜNEN goes so far as to fix the maxima distances of each of the zones of the " isolated State " from its central town. As the only means of transport available to farmers in the original scheme of the " isolated State " was haulage by horses over rough country roads, the costs of transport postulated by VON THÜNEN were extremely heavy, reaching prohibitive figures within relatively very short distances from the town, as at a distance of 50 miles from the central market even extensive grazing ceased to pay.

Modifications of the original scheme.

This simple hypothetical case, with which VON THÜNEN'S name is particularly associated in most people's minds, is extremely suggestive by its very simplicity; but it does not exhaust his investigations. In an Appendix to his work he examines several cases in which the conditions postulated in the original scheme are modified in some sense. The modifications envisaged by VON THÜNEN consist in the existence in the " isolated State " of a navigable river flowing from the periphery to the central town, and of another, smaller, town, with its suburban district; as well as in the assumption of variations in grain prices and in the fertility of the soil. In every case, VON THÜNEN examines the shifts and regroupings taking place in the spatial distribution of farming systems under the influence of the changes he postulates. Elsewhere, he assumes even the construction of railways which, at that time, have been just making their first experiments in practical application, pointing to the great extension which the « isolated State » would acquire if, instead of being hauled by horses over country roads, the goods traffic would be handled by railways. Another interesting assumption he makes is that of the " isolated State " being bounded, instead of uncultivated land which could, if necessary, be turned to agricultural uses, by a barren desert. This last case is interesting because, when applying the principles enunciated by VON THÜNEN to the world, and studying the spatial organ-

ization of agriculture over the surface of the globe, we are faced precisely with such a case of a closed economic system whose agricultural area cannot be extended and which has, accordingly, to meet the increasing demands of its growing population by raising the standards of production.

III. The adaptation of von Thünen's principles to modern conditions.

The world-wide " isolated State ".

The essential difference between the economic conception of VON THÜNEN and that of the modern theory of economic location is that, being true to the conditions of his time, he could build his hypothetical " isolated State " as a limiting case of the semi-closed national economies of his epoch, while the economists of the second half of the XIX century, in order to be in a position to discuss the spatial organization of agriculture in any particular country, had to start from the conception of an " isolated State " comprising the whole civilized world. From this basic conception they had to work down to the several countries, as the agricultural organization of every one of these was determined by its position within the world economic system.

To quote THIES HEINRICH ENGELBRECHT who, writing in the eighties of the last century, was the first to reconsider the theory of VON THÜNEN in the light of later developments in transport and international trade, " at the present time every single national economic unit is merely a part of a great whole, a member of the world economy. The whole civilized world has developed into the likeness of an ' isolated State '. On the outer margin of cultivation, in the outlying colonies of the Southern Hemisphere and in the inland regions of North America and Asia, we see zones of wild ranching; the eastern half of the United States and most of Europe are a zone of cereal growing, while in the immediate vicinity of the great cities on both sides of the Atlantic we see ever-expanding zones of suburban cultivation. In the centre of the world economic system we see industrial England playing the part of the central town in the ' isolated State ' ..." " Thus, if we want to understand the great economic developments of the present time, we cannot confine ourselves to the frontiers of a single country: we must consider not only the economy of a given country, but world economy as a whole " (1).

This does not naturally mean that the fundamental principles governing the degrees of intensity of farming as enunciated by VON THÜNEN do not apply to the spatial organization of agriculture in a particular country. It only means that this organization cannot be expected always to include all the various systems of farming and branches of production. Some countries, indeed, exhibit

(1) TH. H. ENGELBRECHT: " Thünens ' isolierter Staat ' und die Gegenwart " in the presentation volume *Ausgewählte Schriften von Dr. h. c. Th. H. Engelbrecht*, Berlin, 1924, originally published in 1882.

the whole scale of degrees of farming intensities, from the highest in the suburban zones of their large cities to the lowest, represented by wild ranching, in their remoter parts: the United States is a case in point. Other countries, especially those of Western and Central Europe, which in the course of their long history have become densely populated, literally dotted with towns and industrial centres and traversed in every direction by innumerable trade routes, are in a different situation. As a result of their historical evolution, practically every point on their agricultural map came to find itself within the zone of economic gravitation of different neighbouring centres of population and industry, farming being thus generally raised to a high degree of intensity.

Accordingly, to see the influence of economic factors more clearly reflected in all its details upon the agricultural map, one must turn to countries and continents whose vast plains have still tracts of relatively undeveloped and sparsely populated agricultural land, along with regions of older colonization, highly industrialized and more developed economically. In the Old World, such a country is Russia, while in the New World North America, and particularly the United States, is a representative case (1).

Some recent developments and their probable effects.

The continuous accentuation of protectionist tendencies in the course of the last few decades, as well as the recent development of national economic planning, have certainly contributed to make the world-wide " isolated State " less true to reality than it used to appear to the economists of a generation ago. To quote a recent American writer: " One of man's most remarkable inconsistencies is his feverish effort to overcome natural barriers while at the same time he sets up barriers of his own. Americans spend billions of dollars to encourage trade by deepening rivers and harbours; yet, the same legislative bodies calmly pass tariff laws to discourage the movement of goods. The people of the United States have erected around their borders tariff walls which discourage trade more effectively than all the oceans of the world. When viewed realistically, protective tariffs (as well as bounties and subsidies) are simply devices to compel the national economy to assume functions it might not otherwise assume" (2). It should be noted, however, that the tariffs, in order really to achieve the break-up of the world-wide " isolated State" created by the development of the means of transport, must be pushed to a prohibitive level.

Such as they mostly were, until the great world economic depression of 1929-32 had brought about a rapid development of economic particularism and had led to the creation of large imperial and regional economic blocs, customs

(1) According to AUGUST LÖSCH, "in the United States, for our purpose we have the enormous territorial extension combined with a uniformity of geographical, political and economic conditions which appears remarkable from the European standpoint, as well as little influence of tradition and, until lately, a deep belief in reason and freedom " (*Die räumliche Ordnung der Wirtschaft*, p. 238).

(2) H. H. MCCARTHY: *The Geographic Basis of American Economic Life*, 1940, p. 23.

duties could, indeed, have interfered with the smooth working of the mechanism of the world wide " isolated State", but they could not have put it really out of action.

The situation in this respect changed in the course of the decade preceding the outbreak of the present war, as, along with the growing substitution of economic planning for competition and with the development of economic nationalism and of the efforts to achieve economic self-sufficiency or autarchy fostered by the continuous accentuation of international tension, the world market began to show definite signs of dissolution, international trade becoming increasingly localized within large regional and imperial groups.

In our annual surveys of the world agricultural situation for the last decade we have had occasion to point to this tendency and to follow its various manifestations (1). Instead of world-wide triangular international trade there could be observed a marked process of development of bilateral trade relations, largely on a contractual basis instead of free competition, within certain large groups of countries, more or less bound together by close political and economic ties, with a great industrial country as their centre of attraction. This development could not fail to have certain effects upon the structure of the world economic system, which tended thus to break up into several regional or imperial blocs, ceasing to represent a single world-wide " isolated State", such as ENGELBRECHT and others saw it during the epoch when world economy was in the making.

Now, the world would appear to be definitely breaking up again, not into national "isolated States" of the original scheme of VON THÜNEN, but into several large regional or imperial " isolated States". This process of transformation of world economy into an aggregate of regional or imperial economies, though much advanced in the course of the last decade, is still too recent and has been too much conditioned by current political developments, for it to be taken as an accomplished fact. Yet, it undoubtedly has deeper roots than merely opportunistic political considerations dictated by the circumstances of a given period; and if so, the principles of the " isolated State " will have to be applied not to the world as a whole, but to each of the economic groups into which it will be divided.

Influence of steam transport.

The principal cause of the economic transformations of the XIX century was the development of steam transport by rail and by sea. According to ENGELBRECHT, this " does not only extend arable cultivation over wider areas, but it brings about a more pronounced extension of intensive systems of farming, which depend on higher prices, than of extensive agriculture, the latter being confined to relatively narrow peripherical zones": an observation which, in the course of subsequent evolution, has been amply confirmed by facts, both in the New World and in the outlying parts of Eastern Europe.

(1) See *The World Agricultural Situation* for 1934-35 and the following years, in which the development of economic regionalism is discussed.

Particularly interesting in this respect was the agricultural evolution of Russia during the last two decades or so before the war of 1914-18 and the Revolution. There, this trend, which had been noticeable throughout the XIX century, became very marked during its closing years, with the construction of the Transsiberian Railway and the beginning of the vast movement of emigration beyond the Urals. The more intensive systems of farming spread along the railways, clustering in the immediate vicinity of the lines and then, on both sides, shading down to lower degrees of intensity with the increase of the distance from the stations: a picture which reminds of the effects of the shifts produced in the second variant of VON THÜNEN'S scheme by the appearance in the "isolated State" of the navigable river.

In a study of Argentinian agriculture, ANDREAS HERMES gives an instructive illustration of the transformations brought about in that country's agricultural evolution by the development of the railway net between 1880 and 1910, showing how, in the course of these 30 years, the isolated patches of cultivation along the few earliest railways by 1910 have been merged together as the railway net was extended, and the limits of the respective zones of influence of the different lines touched each other ([1]).

Here, however, one could not possibly follow the influence of the railways upon the intensification of farming in the sense of the expansion of intensive at the expense of the extensive systems, both arable cultivation and animal husbandry being carried on along extremely extensive lines and, as pointed out by HERMES, without organic connection with each other ([2]).

It should be noted, however, that at this stage of agricultural development, when animal husbandry consists merely of wild grazing or ranching, the expansion of arable cultivation, even in its most primitive and extensive form, represents a step forward in intensification and tends always, to a greater or lesser extent, to displace ranching and to shift the herds and the flocks further away from the centres of population and industry. Such was the case in Europe, the latest development in this sense, on a large scale, being the gradual expansion of arable cultivation in Russia, on the Northern shores of the Black Sea, accompanied by the displacement of merino sheep-breeding from the provinces of New Russia, towards the East, until, at the beginning of the twentieth century, it preserved some of the importance it formerly possessed throughout Southern Russia only in the South-Eastern provinces, beyond the Don.

Characteristically, in the Argentine, if we consider the evolution of animal husbandry in the period 1895 to 1908, we see that the number of sheep had diminished greatly in the provinces of Buenos Aires, Santa Fe and Cordoba in which arable cultivation had made great progress owing to the railways, while its greatest increase was registered in the provinces of Corrientes, Santiago del Estero, Mendoza, San Juan and La Rioja, all lying on the outskirts of the zone served by

([1]) ANDREAS HERMES: *Zur Kenntniss der argentinischen Landwirtschaft*, Berlin, 1913, Map XIIa showing the development of cultivation under the influence of the railways.

([2]) HERMES, *op. cit.*, p. 96.

the railways (1). Sheep-breeding being, at this stage of agricultural development, probably the most extensive system of land utilization, save hunting, this development here, as in Southern Russia, would appear perfectly to accord with ENGELBRECHT's contention concerning the shifting of extensive systems of farming towards the outer zones.

To the various effects of the development of rapid and cheap transport indicated by ENGELBRECHT we should add that of increasing the influence of natural conditions upon the location of the various branches of agricultural production, first stressed by A. I. SKVORTZOV (2). The development of transport and of the means of conservation of perishable commodities served, indeed, to encourage the tendency of the regions particularly fitted by nature for certain branches of agricultural production to specialize in these branches, with the result that, under modern conditions, the influence of nature, as distinguished from the situation in respect of the market, as a factor determining the location of agricultural production, is stronger than it used to be in the past.

The location of animal husbandry.

Another important modification in the spatial distribution of farming systems due to changed economic conditions and stressed by ENGELBRECHT, is the shift in the location of animal husbandry. It will be remembered that VON THÜNEN had relegated animal husbandry to the utmost outer ring of his "isolated State", the only exceptions admitted by him being the keeping of dairy cows for the production of fresh milk in the suburban zone and the fattening of cattle, which had also to keep near the town to avoid an excessive loss of weight by the animals when driven to market. In the intermediate zones, animal husbandry could not, as a rule, pay its way, owing to the competition of the products of extensive grazing from the outer ring.

The shift in the location of animal husbandry ENGELBRECHT attributes to the great increase in the value of stable manure resulting from the general intensification of farming since the days of VON THÜNEN. The latter assumed that stable manure came, as a rule, from the central town of his "isolated State", and its cost was accordingly lowest in the immediate vicinity of the town, while it rose so rapidly with the increase of the distance from the centre, that on the outer limits of the suburban zone it became prohibitive. In all the other zones, it had to be produced on the farm, and was, indeed, the principal justification of these zones keeping any livestock at all, except for the personal consumption of the farmers.

Now, ENGELBRECHT's view is that the value of stable manure, under modern conditions, is especially high in the districts nearest the market, where the systems of farming are most intensive and require abundant manuring, and, as a general

(1) *Op. cit.*, pp. 101 and 126, see tables.

(2) In his work on *The Influence of Steam Transport upon Agriculture*, published in Russian in 1890.

rule, the more intensive is the farming system, the greater is the value of stable manure. In an intensive system of farming, accordingly, the keeping of live stock, even if it does not pay by its products, becomes a paying proposition if the value of the stable manure it produces is taken into account. This has a decisive effect upon the location of animal husbandry in Europe, on the one hand, and in the zones of extensive farming of the New World, on the other hand. In the former, owing to the high level of intensity of farming, stable manure has a great value, and the European farmer, therefore, can, and even must, carry on animal husbandry in spite of apparent losses on all its other products, his whole profit consisting in the value of the stable manure he gets as a by-product. In the New World, on the other hand, under conditions of extensive cultivation, often without any manuring at all, relying entirely on the natural fertility of the soil, stable manure has practically no value, and livestock has to pay its way entirely out of the proceeds of the animal products marketed.

This circumstance, combined with the influence of the great industrial expansion which took place in Europe in the course of the XIX century upon the purchasing capacity of the non-agricultural population, had, indeed, played an important part in changing the orientation of European farming. Since the beginning of the great agricultural depression of the closing quarter of the last century, European farming has been increasingly turning towards animal production, instead of the formerly predominant cereal growing. Thus, the spatial distribution of farming systems in the world-wide "isolated State" created by the development of steam transport and by the resulting expansion of international trade, underwent far-reaching changes about the close of the XIX century, the migration of animal husbandry, in its more intensive forms, towards the inner zones of the "isolated State" being one of the most important of these changes. This, however, did by no means mean the disappearance or the shrinking of animal production in the outer zones of extensive grazing or ranching, which, on the contrary, expanded in the New World, where their products were widely used in the packing industry and in the world-wide trade in various animal products preserved by refrigeration or other means, as well as in hides and skins.

The increase in wages and in the purchasing capacity of the masses.

A very important development due to the rapid expansion of both agriculture and industry was the marked increase in wages, which distinguished the later part of the last and the beginning of the current century. While VON THÜNEN assumed the real wages of labour to be the same all over the " isolated State ", which, besides, he considered as being in a stationary condition, ENGELBRECHT points out that " in a rapidly expanding 'isolated State' the limits of cultivation are continually extended, along with the growth of the central town, and both on the margins and in the industrial centre the wages of labour are bound to rise ". This was precisely what had been taking place in the world at the time of ENGELBRECHT's writings, when the combination of increasing industrial demand for hands with a growing emigration to the New World produced a general rise in wages.

Among the various effects of this development ENGELBRECHT stresses the fact that, the rise in wages and in the purchasing capacity of the masses being particularly marked in the industrial centres of Europe and in the agricultural countries of the New World, it caused in these a great increase in the demand for the finer and more costly products of agriculture. The new agricultural countries were relatively ill-fitted for the production of these commodities, and were therefore ready to import them from the Old World. " Thus, to quote ENGELBRECHT, it happens that in a rapidly expanding ' isolated State ', the demand for such luxury articles not only in the central town, but in the outer zones as well, can be met at the lowest cost by the inner zones, on condition that improved means of transport and methods of conservation permit to overcome the difficulties presented by distance. The same applies to the growing of technical plants which require much labour and high standards of cultivation, as they can be grown at lower costs in the old than in the new countries, in spite of the land in the latter being cheaper ".

Here, however, ENGELBRECHT's assertion, in our opinion, should be somewhat qualified, as the location of the production of such commodities is mostly determined by the presence in the locality of plentiful labour. This means that frequently such branches of production, requiring intensive methods of cultivation, will be found in relatively distant zones, where favourable natural conditions are combined with an abundance of labour, thus permitting a high degree of labour-intensity to be reached. Such is the case of tobacco in certain parts of the United States, in South-Eastern Europe and in the Near East, of flax fibre in the northern provinces of Russia, of cotton in Russian Central Asia and in India, of sugar beet in the Russian South-West etc.

As we shall see below, the problem of the location of labour-intensive systems of farming, which is very largely a problem of peasant husbandry and has a particular importance in countries where peasant farming predominates, has not been adequately dealt with either by VON THÜNEN himself, or by those who, like ENGELBRECHT, have developed and modernized his original theory.

IV. The problem of labour intensity.

The location of labour-intensive systems of farming in von Thünen's scheme.

Before concluding our brief survey of the present state of the theories of location of agricultural production, it would thus appear necessary to say a few words about the exact position, in these theories, of the problem of the location of labour-intensive systems of cultivation. This position is extremely uncertain as, from VON THÜNEN on, economists have never paid sufficient attention to labour-intensive systems of farming as such.

Labour-intensity was usually considered as merely a makeshift for capital-intensity where capital was scarce, as it generally is in the economically less advanced regions. That this is true to a certain extent, cannot be denied; but neither could it be said that it is the whole truth. It does not account for the numerous cases in which labour-intensive systems of farming or branches of production

live more or less side-by-side with capital-intensive farming, or are found scattered here and there in zones of extensive cultivation, or, finally, when capital and labour-intensity are combined in the same farm. If labour-intensity could be seen to substitute itself gradually for capital-intensity with the increase in the distance from economic and cultural centres and with the passage to less economically advanced regions, the now usual attitude to it could be justified; but as this is not the case, and as this phenomenon has the disconcerting habit of cropping up unexpected in the most unlikely places, thus confusing the design of the ideal agricultural map drawn according to the current theories of location, it has to be examined more closely.

VON THÜNEN had never approached the question of the location of labour-intensive agriculture as such within the framework of his " Isolated State ". To him the problem of the location of intensive systems of farming in the outer zone of the " isolated State " appeared merely as a question of the cultivation of certain crops – in his case of technical plants – and of their place both in the rotation of a farm and in the general scheme of the spatial distribution of farming systems within a country.

The basic propositions governing the location of these branches of production, as stated by VON THÜNEN, were as follows [1]:

(1) When the costs of production are equal, and the output, in weight, is the same, the plant having a more depleting action upon the soil is cultivated furthest from the central town;

(2) When the output, in weight, and the soil-depleting nature of the crop are the same, the plant whose costs of production are higher is produced in the regions furthest from the town;

(3) When the soil depleting nature of the crop and the costs of production are the same, the plant whose unit production, in terms of weight, is lowest, is cultivated furthest from the town.

We see that the problem is approached by VON THÜNEN from three standpoints, none of which is directly concerned with labour-intensity. He deals with it from the point of view of farming technique, considering the soil-depleting effects of the crops ; from the point of view of the weight of the product, considering the costs of its transportation to market and, finally, from the point of view of the costs of production. The costs of production naturally include labour and may be affected by variations in the costs of the latter, which is determined by the rate of wages and the amount of labour absorbed in a given branch of production. In this connection, however, VON THÜNEN's argumentation appears somewhat confused, owing to his having made certain arbitrary assumptions with regard to the relative density of population in the various zones.

As a matter of fact, further on, when he sums up his views on the subject of technical plants, VON THÜNEN actually says that the cultivation of these and the presence of spirit distilleries in the zone of grazing *permit this zone, which*

[1] *Der isolierte Staat*, p. 293.

would otherwise be very sparsely populated, to achieve a considerable expansion in its earning possibilities and in its population (1). In other words, it is not the existence in the zone of plentiful labour that accounts for the location there of such labour-intensive branches of production as the cultivation of technical plants, but the development of the cultivation of these plants that brings about the increase in the density of population. Here, it would appear, VON THÜNEN's reasoning represents a clear case of *petitio principii*, and that because he postulates a situation in respect of wages and labour supply wholly contrary to that existing in real life. According to him, while money wages in the different zones vary according to local variations in the prices of corn, and are therefore low in the outer zone, where corn is cheap, thus attracting to this zone labour-intensive branches of production, real wages are uniform throughout the " isolated State ", such uniformity being assured by the absolute freedom of migration between the various zones. All VON THÜNEN's reasoning here hinges entirely upon the population in all the zones being automatically maintained at an *economic density* by which we mean a density determined by the earning possibilities of the locality. This assumption about the uniformity of real wages, however, VON THÜNEN himself admits to be contrary to reality, pointing as an example to the great difference existing in this respect between Poland and North America (2). Characteristically, he choses two very representative cases, one being that of a relatively old European country already in his days notoriously suffering in many parts of agricultural overpopulation, and the other belonging to the New World and, at the time of VON THÜNEN's writing, still very short of hands. In the former both money and real wages were low, and labour cheap, in the latter the wages were high and labour expensive. While in Poland labour-intensive farming could pay, America was the land of extensive farming seeking to spread cultivation over virgin tracts of land and thus to make good the dearth of labour.

The truth is that the density of population is frequently determined not by the earning possibilities of the country or region, but by historical and other factors, and is, therefore, often non-economic. Unless a given zone is already densely populated and offers the advantage of cheap labour, such labour-intensive branches of farming as the cultivation of technical plants can hardly have an incentive to establish themselves there. This all the more because, as a rule, technical plants are relatively sparing in the use of land and can, therefore, be cultivated in regions where the rent of land is high. Otherwise we would be confronted with the preposterous situation in which a branch of production would find its economic location in a zone where the prices of its products are low and the costs of material means of production high, because of remoteness from the central town, and where, besides, labour is scarce and, therefore, the cost of labour presumably heavy: where, in other words everything would appear to discourage such a venture.

(1) *Der isolierte Staat*, p. 309.

(2) *Ibidem*, p. 535.

What really happens is that technical plants are frequently, though by no means always, cultivated in regions remote from the market and having low prices for farm products, but this depends primarily on the presence in the locality of abundant labour and on low labour costs, which make good the drawbacks of the geographical situation. That the technical and other labour-intensive branches of cultivation are not necessarily confined to the outer zones, is clearly demonstrated by the sugar-beet cultivation in Central and Western Europe, by flax growing in Ireland and in the Netherlands, by the cultivation of hemp and tobacco in Italy etc. In all these cases, the prices of the product are sufficiently high, or are artificially kept on a sufficiently high level, to permit the cost of labour-intensive cultivation to be met, and the whole question is that of the presence on the spot of the necessary labour or of the possibility of attracting it from elsewhere, thus making good the local deficiency.

Labour as an economic factor of the location of farming systems.

Thus, in considering the treatment by VON THÜNEN of the problem of the location of the cultivation of technical plants, which on closer examination appears to cover a variety of labour-intensive branches of agriculture, we see that the scheme of the " isolated State " is in need of certain adjustments to permit it to fit all the possible cases.

The " isolated State " is, indeed, exclusively based upon the variations in the cost of transport, no other factors affecting the location of farming systems being taken into account. In terms of ALFRED WEBER's theory of the economic location of industry, we may say that VON THÜNEN considers the spatial distribution of farming systems as determined by " transport orientation " alone (1).

Yet, in agriculture as well as in the other branches of production, the costs of transport are not the only determining economic factor of location, as high costs of trasport may to a certain extent be compensated by other costs being low. Among these other costs, and that particularly in agriculture, labour is, as a general rule, the most important single item. Accordingly, the presence in a given locality of abundant and cheap labour may not only go very far to make up for high transport costs, but may actually play a decisive part in determining the concentration in that locality of certain branches of production requiring a relatively large outlay of human labour, especially when high transport costs are due not so much to the nature of the product as to the distance from market.

(1) In his work *Über den Standort der Industrien*, published in 1909, in which he laid down the principles of the theory of economic location of industries, ALFRED WEBER, distinguishes between the general and the special factors of location. According to him, the general factors playing a fundamental part in determining the location of an industrial enterprise and acting through variations in costs, are the conditions of transport, resulting in " transport orientation "; labour conditions, resulting in " labour orientation " and the agglomeration of industries in certain localities, in so far as it affects the costs of production. ALFRED WEBER's treatise not being available to the present writer, it is referred to here following OSKAR ENGLÄNDER (" Kritisches und Positives zu einer allgmeinen reinen Lehre vom Standort ", *Zeitschrift für Volkswirtschaft und Sozialpolitik* 1926), HANS RITSCHL (" Reine und historische Dynamik des Standorts der Erzeugungszweige ", *Schmoller's Jahrbuch*, 1925) and WITOLD KRZYZANOWSKI (" Review of the Literature of the Location of Industries ", *Journal of Political Economy*, April 1927).

The relative importance of the costs of labour in the total costs of production of agriculture may be seen from the table below, based upon the results of farm accountancy for the agricultural year 1931-32 [1]:

Relative importance of the cost of labour in the total costs of agricultural production.

	Number of farms	Total costs in g. francs per hectare	Cost of labour	Other farm expenses	Interests on total capital invested
			In per cent. of total costs		
Denmark:					
peasant farms	472	723.30	32.2	50.7	17.1
large farms	130	555.03	34.3	47.0	18.7
Finland:					
peasant farms	677	230.75	35.0	28.5	36.5
large farms	93	223.27	33.6	33.7	32.7
Sweden:					
peasant farms	403	516.77	42.8	35.8	21.4
large farms	131	490.85	37.7	42.3	20.0
Norway:					
peasant farms	197	822.09	34.1	40.4	25.5
Poland:					
peasant farms	437	274.48	34.3	25.8	60.1
Switzerland					
peasant farms	541	1,412.00	36.2	38.0	25.8

These figures, drawn from a large number of farms in several countries, different in many respects, show how very important a part is played by the cost of labour in the total costs of production of agriculture, and how far it is more important than that of the material means of production. It is clear that, except under extremely backward conditions of transport, approaching those postulated by VON THÜNEN in the original scheme of the " isolated State ", even modest variations in wage rates between different localities can easily compensate for very considerable differences in the distance from market and in the costs of transport.

If, with VON THÜNEN, we assume that at a distance of only 50 miles from the central town the costs of transport are so heavy that they absorb the whole price of grain or of animal products on the market, variations in any other elements of costs, including labour, can hardly affect the spatial distribution of farming systems to any noticeable extent, neutralizing the effects upon it of the distance from market. But when, as VON THÜNEN had foreseen in later

[1]) *Farm Accountancy Statistics for 1931-32*, I. I. A., Rome, 1936, pp. 64-85.

comments upon the "isolated State", in speaking of the influence upon his scheme of the development of railways, the "isolated State" would have expanded to many times its original size, the influence of the local variations in the cost of labour could not by any means be overlooked and in the world-wide "isolated State" dealt with by ENGELBRECHT it ought certainly to have been taken into due consideration.

Under modern conditions of transport, its costs have, indeed, diminished to an enormous extent, representing a relatively modest percentage of the total expenses and of the market prices. This may be illustrated by the following figures showing the prices of Canadian Manitoba No I wheat at Winnipeg, on the one hand, and on the ports of London and Liverpool, on the other hand:

Prices of Manitoba No. 1 wheat at Winnipeg and in London and Liverpool in gold francs per quintal.

	Averages for the month of January of		
	1928	1929	1930
Winnipeg	27.33	22.92	24.66
London and Liverpool	28.76	20.83	27.94
Difference in per cent. of Winnipeg prices	5.2 p. c.	17.0 p. c.	13.3 p. c.

It should be noted that the London and Liverpool prices are c. i. f., thus including all transport charges, and that, besides, they include also the dealers' profits. The percentage for 1928 should be considered as normal, the higher figures for 1929 and 1930 being accounted for by the heavy fall in the prices of wheat in Canada, reflected in the Winnipeg prices, which resulted in the costs of transport, insurance etc. being heavier in relation to prices.

According to a recent estimate, the costs of transport in Europe average about 5 to 7 per cent. of the price of the products at the place of consumption (1).

Thus, with the development and the cheapening of transport, the part played by the local variations in the various items of the costs of production proper tends naturally to increase. Among these, as we have pointed out, the most important single item by far is labour, the cost of which displays relatively very wide variations, especially in the less economically advanced countries.

As an example, we may point to pre-revolutionary Russia, where during the period 1906-10 the average wage rates of agricultural labour in the different regions were as follows (2):

(1) CARL PIRATH: "Dezentralisation der Industrie und die Transportkosten", *Raumforschung und Raumordnung*, June 1937, p. 366.

(2) Reproduced from GEORGE PAVLOVSKY: *Agricultural Russia on the Eve of the Revolution*, p. 207.

Average daily wages of agricultural workers in Russia in 1906-10.

Regions	Male workers			Female workers		
	Spring	Hay	Harvest	Spring	Hay	Harvest
	Copecks per day					
Northern	80	93	84	46	57	54
North-Eastern	61	75	68	40	52	53
Petrograd	54	71	64	35	43	46
Moscow	67	90	81	41	49	53
Western	56	71	66	33	41	43
South-Western	41	56	63	31	41	45
Ukraine	53	77	86	37	46	56
Central Agricultural	50	66	75	30	38	48
Middle Volga	57	78	72	43	41	48
Eastern	57	74	81	35	43	53
New Russia	70	95	126	49	61	90
South-Eastern	81	95	148	56	69	89
Caspian (Terek only)	82	117	131	56	71	79

The rates of wages were closely related to the density of agricultural population in the respective regions, the lowest being registered for the South-Western, Central Agricultural and Ukrainian provinces which suffered most from rural congestion. The highest rates of wages were reached in New Russia and in the South-East, two regions to which there has been an annual migration of seasonal workers from the congested districts of the other provinces. In comparing the intensity of farming in the various parts of Russia, with the exception of the zones about the two capitals and some other large urban and industrial agglomerations, one could also observe a close correlation between the density of agricultural population, the rates of wages of farm labour and the intensity of farming. This latter reached relatively high degrees of labour-intensity in the South-Western provinces, the Ukraine and the Central Agricultural region, where nearly all the production of sugar-beet, as well as of certain other labour-intensive crops was located, and which were those with the highest density of agricultural population and the lowest wage rates. At the other end of the scale stood the South-Eastern region, comprising the former provinces of the Don, Kuban and Stavropol, distinguished by a density of agricultural population of 17 per square verst (1897) – the lowest in European Russia, save for the Northern, North-Eastern and Petrograd regions, with their extensive forests and marshes, and their small proportion of agricultural land – by high wages and by some of the most extensive systems of cultivation still surviving in the European provinces of the country, without even regular fallowing, as well as by being the last refuge of extensive merino breeding in Russia.

No less characteristic than in Russia are the wide local variations in agricultural wages in the United States, as shown in the table below according to regions.

Daily wages, without board, of male farm labour in the United States in 1929.

Regions		January	April	July	October
		Dollars			
United States	*Average*	*47.24*	*49.00*	*50.53*	*50.00*
	State maximum	90.00	90.00	50.53	50.00
	State minimum	26.50	26.25	28.00	27.75
North Atlantic	*Average*	*66.22*	*68.74*	*70.97*	*69.90*
	State maximum	81.00	84.00	84.00	86.00
	State minimum	59.00	58.75	62.00	60.00
North Central	*Average*	*51.74*	*56.44*	*58.18*	*57.41*
	State maximum	57.75	66.00	69.50	67.50
	State minimum	43.00	65.50	66.50	63.75
South Atlantic	*Average*	*35.18*	*35.10*	*35.77*	*36.02*
	State maximum	50.25	50.50	52.25	50.75
	State minimum	26.50	26.25	28.00	27.75
South Central	*Average*	*36.23*	*35.95*	*37.44*	*36.70*
	State maximum	41.50	40.75	42.50	42.00
	State minimum	31.00	30.00	30.00	27.00
Far Western	*Average*	*74.72*	*76.99*	*79.11*	*78.93*
	State maximum	90.00	90.00	90.00	90.00
	State minimum	50.00	51.00	52.00	52.00

As we can see, the highest wage rates are those paid in the Far Western region, which, by its agricultural conditions and by the density of population, roughly corresponds to the South-Eastern region of Russia, as a zone of late colonization and extensive farming, except for California, whose conditions are quite peculiar. The lowest wage rates are registered in the South Atlantic and South Central regions, where, apart from the density of rural population, the widespread employment of coloured labour tends to depress their level. In any case, and whatever the reasons of it, here also the local variations in wages and in agricultural labour conditions are very marked.

In most countries and regions where peasant farming predominates the typical form of intensive cultivation is generally represented by labour-intensity. By the employment of family labour, with its flexible rate of remuneration in kind, the peasant farmer is in a position, with given prices for his products, to increase his gross return per acre, by the intensification of his methods of farming, to a considerably greater extent than the large farmer depending on hired labour. In the regions suffering from agricultural overpopulation, where the peasant smallholders are particularly in need of increasing the gross return from their holdings, they often go far beyond the economic limits of rational intensification, as determined by the prices of farm products, meeting the deficit out of their families' labour earnings. As this phenomenon is very widespread, and as it affects large farming as well through the local level of farm wages, which are low in

the congested rural districts, it cannot be left out of account in any theoretical scheme of the spatial distribution of farming systems. As a recent German writer puts it, " small farms are mostly very richly endowed with labour, which represents in this case a definite factor of location " (¹).

The necessary adjustment.

Such being the case, a scheme of the spatial distribution of farming systems which does not consider the influence of labour conditions is obviously incomplete. Only by considering " labour orientation" as well, as this is done by ALFRED WEBER in the case of industry, is it possible to meet all the various cases of the spatial distribution of agricultural production and to get out of the ambiguity into which VON THÜNEN'S deliberate elimination of the variations in the labour factor had led him.

Instead of assuming the uniformity of labour conditions and real wages throughout the territory of the " isolated State", which is an assumption too obviously contrary to the facts of actual life, as does VON THÜNEN, or limiting the exceptions to this assumption to special cases, as does ENGELBRECHT in adapting the former's scheme to the conditions of modern world economy, one should construct the theory of the location of farming systems on the express assumption of labour conditions and wages being different not only in different zones, but frequently even in different parts of the same zone.

Thus in adapting the principles of VON THÜNEN'S scheme to modern conditions under which transport costs have lost some of the decisive importance they had in the " isolated State", while the influence of natural conditions and other factors had relatively increased, the local variations in the cost of labour must certainly be taken into consideration.

Whereas, in VON THÜNEN'S original scheme, in establishing the price-costs ratios in the various zones, the supply of labour and real wages were consistently treated as constants, while the costs of material means of production varied in proportion to the changes in the distance from the central town, now the labour factor must also be treated as a variable quantity. Its variations, however, unlike those of the cost of material means of production, will not be related to the distance from the market, but will depend on the special labour conditions in a given locality. As the density of the agricultural population of many localities is determined by a complex of social, economic, political and other factors, which in the course of history have led to the agglomeration of agricultural population in certain districts, thus causing an abnormal competition on the labour market and a depression in wages, it will not be determined by the intensity zones to which the locality belongs, as it would, had the geographical distribution of population been determined wholly by the earning possibilities of the locality and had it, therefore, represented the so-called ***economic density of population*** (²).

(¹) W. BUSCH: *Die Landbauzonen im deutschen Lebensraum* (1936), p. 17.

(²) Such a distribution of the density of population is often assumed by economists as a basis of their constructive efforts, with the result of getting, like VON THÜNEN, into difficulties and contradictions, be-

By thus modifying the basis of the theoretical determination of the spatial distribution of farming systems, we are enabled completely to cover all the possible cases, including that of labour-intensive agriculture. The general principle that the economic location of farming systems depends on the distance from market (cost of transport), as enunciated by VON THÜNEN, will be subject to the reservation that this is so unless the special conditions of a given locality, generally connected with the relative density of its population, permit the adoption of systems of farming more intensive than those common in the zone as a result of low wage rates, or even necessitate such relative overintensification. In some cases, indeed, the pressure of population upon the limited area of agricultural land may lead to the intensification of farming being pushed actually beyond the economic limits, as determined by the Law of Diminishing Returns. It is true that this happens mostly under conditions of self-sufficient maintenance farming working not for the market but for consumption; but in commercialized peasant farming, in congested districts, this phenomenon is more widespread than might appear at first sight, and often absorbs a considerable part of the peasant family's labour earnings.

This modification of VON THÜNEN's original approach will bring into the general scheme of the world-wide "isolated State" such now overlooked phenomena as the labour-intensive agriculture of China, Japan and other Asiatic countries, with their teeming population, as well as large groups of peasant farmers elsewhere.

V. The three basic problems of economic planning in connection with the spatial organization of agriculture.

Preliminary observations.

After a period of belief in the inherent power of the competitive system to heal its deseases by the automatic process of self-adjustment, the world has now entered into a phase of economic development in which this old faith is being substituted by a belief in deliberate planning. The systems of planned economy now in being may differ in every respect, but they are all at one in recognizing that the competitive system had signally failed in making good the claim that the free play of economic forces in competition ensures the well-being of the com-

cause, though theoretically it should be so, in real life the density of population in a given locality is the result of a complex of causes, among which the non-economic factors often predominate. As an example we may quote G. I. BASKIN who, in his *Critical Examination of the Results of the All-Russian Agricultural Census of* 1916 (in Russian, 1916) says: "The distance from the local marketing centres determines not only the degree of influence exercised by them upon a given group of farms, but also takes into account the influence of the density of population, because this last diminishes with the increase of the radius. As the distance diminishes, the economic density of population regularly increases. The density of population and the distance of the farms from the local marketing centres are, therefore, two interrelated phenomena" (pp. 51-3, quoted from KNIPOVICH, *op. cit.*, pp. 127-8). But the trouble is that the distribution of population in real life does not always correspond to the economic density, and there we have the phenomenon of agricultural overpopulation or rural congestion.

munity or of the individual, and that stable prosperity, if it can be achieved at all, must be secured by deliberate Government intervention in the course of the economic process.

Thus, economic planning seeks generally to ensure steady economic progress, undisturbed by business fluctuations which have proved to be an inherent feature of the economic organization based upon competition, and in the long run to secure to the community as a whole the highest possible return from the co-ordinated working of all the productive forces, human and material, at its disposal.

This principle naturally applies to the spatial distribution of economic activities in the country. In a planned economy, instead of being taken for granted, such as it comes out of the free play of economic forces in competition, the spatial distribution of economic activities must be rationalized and controlled with the definite object of achieving the highest possible degree of productive utilization of all the resources. Such rationalization must permit technical progress to be fully put to the service of the community, thus avoiding the paradox of "misery in plenty" which the competitive system proved unable to master.

A defective utilization of the available economic resources and excessively high costs of production and distribution may be caused by the spatial organization of economic activities in two different ways. They may be due to the size and configuration of the country which may involve heavy costs of transport and may place certain natural resources beyond the reach of profitable exploitation. In this case, the evil is rooted in space as such and must be combatted by overcoming the obstacles opposed by distance. Or, quite apart from the factor of distance, the spatial distribution of population and of the various branches of production, owing mostly to historical causes, may be such as to prevent all the productive forces of the community to be used to the best advantage.

The spatial organization of agriculture, apart from the influence of natural conditions, which is essential, is determined by the factors of economic location. These consist of the situation of the farm with regard to the market, which determines the cost of transport and, therefore, the local prices of the products and of the means of production; of the capacity of the local markets, which depends upon the industrial development of the country and the distribution within it of industrial centres and of non-agricultural population; and, finally, of the spatial distribution of the agricultural population, which determines the supply and the cost of agricultural labour in the different parts of the country.

Thus, in any attempt at achieving a rational spatial organization of agriculture, which would ensure the most advantageous utilization of the country's agricultural resources, economic planning must aim, in the first instance, at creating those conditions of economic location which would permit this object to be achieved. This will involve the solution of the three following basic problems:

(1) The overcoming of distances by the rational organization of transport facilities;

(2) The rational distribution of industries and of industrial population over the territory of the country;

(3) The rational spatial distribution of agricultural population.

Only if and when these three basic problems are solved, the necessary preliminary conditions of economic location will be created for the technical organization of agriculture proper which will enable the agricultural resources of the country to be used to the best advantage.

Below, we shall give a brief outline of these three basic problems.

Development of transport facilities.

To any one acquainted with VON THÜNEN'S " Isolated State " an insistence upon transport may seem superfluous, and as this is undoubtedly true, we shall limit our remarks on this subject here to a few words.

In any economic system, whatever its organization, the problem of space which determines the burdens imposed upon the various branches of economic activity by the necessity of long-distance transportation, plays an enormous role. Indeed, the excessive territorial extension of a country may actually determine the loss by it of a large part of the advantages it possesses in its natural wealth.

It may generally be assumed that the possibilities of economic progress in countries endowed with a certain definite quantum of natural resources and a given number of population stand in inverse proportion to their territorial extension. The larger the territory and the longer, therefore, the distances to be overcome between the place of production and that of consumption of the various commodities, the slower and the more difficult proves to be the country's economic development. Russia is an outstanding example of such a case, her territory consisting for about 50 per cent. of barren subarctic regions, which occupy all the zone to the North of an imaginary line running roughly from Archangel in the West (65° N) to the South of Kamchatka in the East (54° N), and land suitable for cultivation stretching in a relatively narrow belt across the whole Asiatic continent. The United States, apart from the distances being much shorter than in Russia, and the territory including a far smaller proportion of barren tracts, owes its rapid economic expansion to the continuous influx from the Old World of millions of hands and of vast sums of capital. Canada's position is somewhat similar to that of Russia in that her territory is for the greater part occupied by subarctic wastes, but she resembles the United States in that she has been assisted in its development by large investments of British and American capital. Australia, with her inland regions being practically an arid waste, and land suitable for cultivation lying mostly along the sea-shore, is another case in point.

In this form the problem of space presents itself mostly in the countries less developed economically and demographically, where it is reduced to the provision of transport facilities. Even in such countries, it is true, the problem of spatial organization is not confined to that of the creation of a sufficient network of railways, roads, waterways and other means of communication. With the exception of regions still in course of colonization, even these countries are also faced with various anomalies, mostly due to survivals of the past obstinately clinging to life and standing on the way to rationalization. In Russia, with her thousand years of historical vicissitudes to look back to, these survivals are fairly

numerous and deep-rooted, especially in the shape of heavily congested rural districts and of small towns which, in the more or less distant past, possessed a certain economic importance, but have lost it owing to new railway lines having diverted trade into other directions or to some other economic shifts. In Canada, such survivals are especially numerous in the French provinces of the Dominion. In Australia, they are probably fewer, but perhaps more important, as the anomalies in the spatial distribution of economic activities depend there not so much upon history and tradition, as upon the ingrained tendency of the race towards urbanization.

Yet, compared with the more economically advanced countries, especially those situated in the limited spaces of Western and Central Europe, in these countries, with their extensive territories, the other problems of spatial organization of economic activities recede to the background before the fundamental problem of transport facilities. Here, one of the principal tasks of the planning authority, without the preliminary solution of which no programmes of economic development can succeed, must be the rational organization of a basic network of railways, waterways, motor roads and air lines, so co-ordinated as to facilitate the gradual expansion of the country's economic activities.

In the countries more advanced economically, with their basic network of railways already sufficiently dense, the centre of gravity of the transport problem lies now mostly in the construction of motor roads, (1) serving partly to lighten the burden of traffic on the railways, partly to bring into closer connection with the markets the districts lying in the interstices between the zones of economic gravitation of the existing railways. Here, in the solution of the various problems of spatial economic organization, the development of motor roads and the scientific application of differential tariff rates are probably the most powerful instruments in the hands of the Governments (2). Tariff policy is also one of the oldest expedients of economic intervention, widely practised by the Governments even in the days when they professed a policy of *laissez faire*. It has to be used, more methodically and with surer effect, in an economic system comprehensively planned and controlled.

The decentralization of industries.

In his work on the economic location of industries, ALFRED WEBER included the tendency of industries towards agglomeration in great centres among the three principal factors which determine the choice of location for a factory

(1) See WERNER TEUBER: " Die Bedeutung der Reichsautobahnen für die Raumordnung ". *Raumforschung und Raumordnung*, July 1937, pp. 401-403, in which he considers, *inter alia*, the effects of the motor roads upon the decentralization of population and industry and upon the districts less well served by the existing railways.

(2) See WILHELM KLEINMANN: " Die Verkehrspolitik als ein Hebel der Raumordnung ", *Raumforschung und Raumordnung*, April-May 1939, pp. 159-162. All this issue deals with various aspects of the transport problem in relation to the spatial organization of German economy.

or works. Both direct observation and statistical data would appear to support the contention that, in spite of some undoubted drawbacks such a choice of location may present, the attraction exercised by the existing great industrial centres upon new business ventures is sufficiently great to bring about the continuous growth of such agglomerations (1).

From the point of view of the rational spatial organization of economic activities, such agglomerations of industries present themselves in a somewhat different light in the more advanced industrial countries, on the one hand, and in the economically younger countries, still in the early stages of their industrial development, especially if their relatively great territorial extension makes their transport problems difficult of solution, on the other land.

In both cases there exist industries which have practically no choice of location, such as mining or some other branches of heavy industry which are naturally bound to a certain geographical point. These frequently constitute the original nuclei of future agglomerations, as by forming large concentrations of population and by the need they have of various subsidiary branches of production, they attract to the spot various other industries. Here we have cases of natural agglomeration, which often cannot be avoided without considerable loss not only to the businesses concerned, but to the community as well. It is not in connection with these cases, but with those which are largely due to historical causes and to the influence of other non-economic factors, that the question of decentralization arises.

In the highly industrialized countries, the decentralization of industries is mostly rendered necessary or useful by reasons of economic and social policy, or even by political and military considerations. Among the economic and social reasons, we should point in the first instance to the more even territorial distribution of sources of earnings, to the improvement of housing and general living conditions of the workers and to the prevention of the depopulation of the countryside by the creation of additional sources of earnings in rural districts. In these countries, it is practically never necessitated or rendered desirable by reasons connected with a reduction in the costs of transport of the raw materials to the factories and of industrial products to the places of final consumption.

The cost of transport may, indeed, even be increased by decentralization, in so far as the agglomeration of industries brings together the various subsidiary branches of production, as well as the industries producing goods of direct consumption for the local consumers. An estimate recently made by a German writer puts the average costs of transport in Europe at 5 to 7 per cent. of the price of the product in the place of final consumption and calculates that a rational decentralization of industries would probably increase them to about 10 per

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(1) See Hugo Böker. "The Progress of Urbanization in the World", *Monthly Bulletin of Agricultural Economics and Sociology*, I. I. A., April 1942.

cent. of the final price, which, in his opinion, would be amply justified by the advantages accruing to the community from such a measure [1].

As, in these countries, the carrying-out of the decentralization of industries unavoidably produces considerable wastage in the process of undoing and reconstructing an existing organization, causing considerable damage to vested interests, much dislocation in business and heavy expenses in new buildings, equipment etc., the problem there is not an easy one, and has to be approached with great circumspection. The decentralization, accordingly, has largely to be achieved not by the transfer of existing industrial undertakings, but by a policy favouring the establishment of newly created factories and works away from the existing agglomerations [2].

In the economically less developed countries, the problem presents itself in a somewhat different light. There, the question of transport is one of the basic considerations, and all those industries which are not necessarily bound to a certain geographical point, and which produce goods for direct consumption, should be located, as far as possible, in or near the places of consumption, and should make the largest possible use of local raw materials. To achieve it, the programmes of industrial and agricultural production for each particular region should take into account this consideration by ensuring the production on the spot of the necessary raw materials and the setting-up of factories for their transformation [3]. Here, in countries in which industrial production is in course of being developed, the problem of decentralization, in the strict sense of the word, does seldom arise. Their problem is rather that of not permitting excessive concentration of industry in large agglomerations to take place by giving the spatial organization of industrial production the right start.

As all the other problems of the spatial distribution of economic activities, the problem of decentralization of industrial production must be approached from the point of view of the basic principle of planned economy which demands the most productive utilization of all the resources of the community.

Considered from this standpoint, the decentralization of industries is important not only because of the economic effects exercised by it upon the industries themselves, but because of its effects upon the economic system as a whole, and especially upon agriculture.

(1) CARL PIRATH: "Dezentralisation der Industrie und die Transportkosten", *Raumforschung und Raumordnung*, June 1937, pp. 366.

(2) J. H. NADERMANN: "Auflockerung der Industrie und Probleme der Verkehrspolitik", *Raumforschung und Raumordnung*, N° 6, 1940, pp. 257-261.

(3) As a recent example of such policy in a planned economy, we may point to the efforts made in the U. S. S. R. under the Third Five-Years' Plan (1938-42) for the decentralization of the industries working for current consumption. The object was to reduce the freight traffic of the railways, already heavily overloaded, as well as to achieve the fullest and most economical utilization of local resources in raw materials and labour.

In an economic system based upon private property on land, the excessive concentration of industries in a few large agglomerations leads to the creation in the immediate vicinity of these centres of relatively wide zones of suburban agriculture, distinguished by high prices of agricultural products, intensive cultivation, high rents and inflated land prices. The high profits of farming and the competition for land on the part not only of farmers, but of industries and speculative investors as well, generally tend to raise the prices of land far beyond its agricultural value and thus to produce an overcapitalization of farming in these localities (1). Such overcapitalization, due to excessive purchase prices of land, represents a great danger to the financial stability and solvency of the farm business, and it may prove on occasions particularly dangerous in the suburban zones of high farming generally engaged in the production of relatively high-priced "luxury" commodities having a very elastic demand and much affected by fluctuations in the earnings of the urban population.

Moreover, the overcapitalization of farming, in its effects upon agriculture, is not unlike agricultural overpopulation in that, like this latter, it has the tendency to push the intensification of farming beyond the economic limits. Faced with the absolute necessity of meeting the fixed capital charges, the farmer is driven to disregard the relative diminution of his earnings in respect of the ad ditional portions of labour and capital invested in cultivation, if by that he achieves the much needed increase in his gross return. In the general economy of the country this involves a definite waste of labour and capital, which could be better employed elsewhere: a loss which a rational spatial distribution of economic activities should seek to avoid.

The impulse towards the intensification of agriculture, in a country in which the industries and the non-agricultural population are more evenly distributed, is more widespread and less urgent. Under such conditions, the fresh investments in cultivation, not being made under the pressure of the urgent necessity of increasing the gross return of the farm at all costs, may be kept within rational limits, thus achieving better results from the point of view of the utilization of the country's resources.

One of the most important effects of the decentralization of industries upon agriculture thus consists in the levelling of land rents and land prices. While the inflated land values of the suburban zones of the overgrown industrial agglomerations are deflated, the land values in the other parts of the country are raised, and land which, before, in the remoter districts, had occupied a marginal position, is made to pay rent and to fetch better prices.

Another exceedingly important aspect of the decentralization of industry, from the social and economic points of view, consists in that it helps the solution of the problem, particularly acute in the more congested rural districts, of the profitable utilization on the spot of the surplus of labour, thus avoiding the necessity

(1) The prevention of the inflation of land prices has lately been the object of legislative measures in several countries, as may be seen from a study by GIULIO COSTANZO: "The Agricultural Land Market and its Control", *Monthly Bulletin of Agr. Econ. and Soc.*, I. I. A., May 1941.

for large numbers of people to abandon the land and to migrate into the over-crowded urban and industrial centres. In this respect, the decentralization of industrial production creates a substitute for the various rural industries, arts and crafts, in which, in the past, the rural population found a source of supplementary earnings, and which have been mostly destroyed by the competition of factories.

The wider spread of industries over the country also leads to the better penetration into the countryside of those various little amenities and cultural possibilities of the cities which are undoubtedly among the contributing causes of the power of attraction exercised by the town over the youth of the country.

The spatial distribution of agricultural population.

As we have had occasion to point out, the spatial distribution of agricultural population in any country at any moment is the result of a combination of numerous factors, and, being a product of a heterogeneous complex of historical influences, it can frequently find no economic justification. In other words, the agricultural population is generally distributed not according to the capacity of the different localities to ensure a certain standard of living to the people engaged in agriculture, but according to the historical conditions which, in the past, have led to the greater or lesser agglomeration of population in certain localities, to the distribution of holdings and their size, to the various legal and customary bonds which tied the population to the spot and prevented its migration between the different regions, and to an infinite number of other causes.

As a result, from the point of view of ensuring to the community the most advantageous use of the human and material resources at its disposal, the spatial distribution of agricultural population in most countries leaves much to be desired. The principal manifestation of the irrational distribution of agricultural population, which brings about the incomplete or inefficient utilization of the human and material productive forces in agriculture, as well as a lowering of the standard of living of the agricultural population compared with the other social groups (1), is the widespread phenomenon of agricultural overpopulation (2).

We are not in the position to enter here into a closer examination of the manifestations of the economically irrational distribution of agricultural population. Here, we shall only point out the economic effects of these anomalies and briefly deal with the principal measures of spatial economic planning and organization by which they can be eliminated or their effects mitigated.

In dealing with the case of labour-intensity, we have already referred to the fact that, in the congested rural districts, where the small farmers have to

(1) See HUGO BÖKER: "Agriculture's Share in the National Income and the Agricultural Situation", *Monthly Bulletin of Agric. Economics and Sociology*, January 1941.

(2) See C. J. ROBERTSON: "Population and Agriculture, with special reference to Agricultural Overpopulation", *Documentation for the European Conference on Rural Life*, 1939, I. I. A. Rome, 1939.

make a living out of holdings not large enough to provide for the needs of the peasant family, the peasants, unless they can eke out their income by sufficient outside earnings or by some domestic industries, have to push the intensification of their farming far beyond the limits indicated by the Law of Diminishing Returns. This means that, in order to raise the gross return of their farms to the maximum, they would employ on them their family's labour without any regard to its remuneration. Indeed, as the family's labour earnings do not represent for the peasants disbursements in cash, as do the wages of hired labour, this item in their costs of production is very elastic, being only a conventional formal entry in their accounts, which is calculated on the basis of current wage rates. During periods of depression, the elasticity of this item enables the peasant farmer to resist better than does the large farmer dependent on hired labour, and this constitutes a great source of force and vitality for the peasant family farm. In the congested rural districts, however, this elasticity is strained to the extreme, the peasant family's labour earnings being permanently reduced to a minimum and their standard of life often dangerously lowered. It is hardly necessary to dwell here on the economic and social effects of such a situation, from both the peasant's own and the community's point of view.

When we consider the question of rural congestion from the point of view of the rational spatial organization of agriculture, by which we mean an organization which ensures the most advantageous utilization of the human and material resources at the disposal of the community, we can see that the existence of agricultural overpopulation in certain parts of the country represents a definite waste of labour.

In the congested agricultural districs, as we have said, the peasant is so urgently concerned with the raising at all cost of the gross return of his small holding that he pushes labour-intensity beyond the economic limits. As a result, the return per man-day is more or less considerably reduced, and the contribution of the labour employed under such conditions to the aggregate production of the country is much smaller than would have been that of the same amount of human working power if it were applied elsewhere, to a holding still leaving enough room for the profitable intensification of the system of cultivation. This, indeed, in many cases constitutes the economic reason of the policy of internal colonization by which the working power whose efficiency is unreasonably low in one locality is transferred to another locality, where it can be utilized in agriculture to the greater advantage both of the community as a whole and of the individuals concerned.

Apart from internal colonization, which is the obvious remedy in this case, when it is practicable, the principal means for combating the evil of agricultural overpopulation consists in the creation of employment outside their family holdings for the surplus of agricultural labour.

In the case of the countries still predominantly agricultural, this implies in the first instance industrialization, the possibilities and directions of which depend on the natural resources of the country and on its capacity either of obtaining from abroad the necessary capital, or of organizing industrialization by

its own means and bearing the temporary sacrifices involved by it for the population.

In the industrial countries, this problem is largely merged with that of the decentralization of industry and the general revision of its spatial distribution over the country. Here, rural congestion must generally be dealt with by means of remedies of local character, involving the encouragement of the transfer of industrial production to the congested areas and the establishment there of newly-founded factories and works. This must be considered as the principal way of solution. In some particular cases, the situation may be improved by the development of small rural industries, arts and crafts; but this solution requires special technical or artistical aptitudes in the local population, which are not always available in such districts; moreover, an improvement achieved by this means is always precarious owing to the continuous menace of factory competition if the venture proves really a commercial success.

In our modern industrial civilization, it is rather from industry itself, through its decentralization and its deliberate diversion towards congested rural districts, that one can expect a solution of the problem. This is all the more so that, as it would appear, the rapid technical progress of farming, which tends continually to increase its production, creates a situation in which a state of relative agricultural overpopulation, with its unavoidable concomitant of the lowering of the standard of life of the agricultural population as compared with that of the other social groups, instead of being a localized complaint, becomes increasingly generalized, and demands a comprehensive solution. Indeed, it may prove that, in order to prevent excessive urbanization, with its undoubtedly evil social and hygienic effects, the Governments, faced as they are with the problem of agricultural impoverishment and of the depopulation of the countryside, will have to envisage the ruralization of industry, thus achieving a combination of rural life and industrial occupation for millions of people who would otherwise have migrated to the towns.

Apart from the phenomenon of overpopulation, the incomplete utilization of the working capacity of the agricultural population may result from too one-sided a system of farming, in which periods of intensive seasonal work alternate with long spells of enforced idleness. In this case, the principal remedy consists in the modification of the local organization of agricultural production by the introduction of new crops etc. The possibility of such improvements, however, besides natural conditions, depends upon economic factors, and unless the existence of suitable marketing facilities at home or abroad permits it, no efforts will succeed in the long run in changing the situation. Accordingly, here also, the problem will consist, in the first instance, in so planning and organizing the spatial distribution of industries as to provide agriculture in the districts where working power is wasted in this manner, with a possibility of modifying the farming systems and thus ensuring more regular occupation to the available labour. In some cases, the situation in this respect may be improved by the development of exports abroad of the agricultural products of the districts concerned, if foreign markets may be found which will permit a more varied production.

VI. Conclusion.

To conclude, a few words should be said about the tasks of economic research in connection with the spatial organization of agriculture. These tasks are clearly indicated by what has been said above of the basic problems of economic planning in this domain.

The work of creating and improving the conditions of economic location on which we have been dwelling in the preceding few pages will have to be based upon a solid foundation of concrete data of fact which at the moment are often either scarse or non-existent, and will require a large amount of theoretical investigation in order to establish the general principles of the various measures to be taken, as well as to estimate their probable effects. All this will open up a vast field of statistical and economic research of vital importance for the success of eventual planning and organization.

In connection with the development of transport facilities and their better adaptation to the objects pursued, statistical and economic investigations will have to concentrate, in the first instance, upon the actual traffic of the various regions coming into consideration, its principal directions and the means by which it is served, as well as its costs. The transport requirements of the region will then have to be studied, taking into account its producing and consuming capacities, as well as the local prices of the various essential commodities compared with those ruling in other parts of the country and on the world market. Then, the question will have to be investigated as to the best way in which the transport facilities of the region concerned should be developed so as to contribute to the improvement of the conditions of economic location of its agriculture. The costs of transport and the incidence of the goods' tariffs upon farming in the different localities should form a subject of particularly close study.

In connection with the spatial distribution of industry and, with it, of non-agricultural population, apart from a general survey of the existing situation in this respect, which must form the basis of all further work, numerous local investigations will have to be carried out with a view to improve the position of the districts most in need of greater marketing facilities for their agricultural products and of additional earnings for the surplus of rural labour. These investigations will evidently have to take into consideration the natural conditions and resources of the districts concerned, their present conditions of transport and the changes in these which their industrial development will require etc., so that the field of research in this case will be particularly wide. To a certain extent these researches will necessarily overlap with those in connection with transport facilities and of the distribution of agricultural population, which, however, will be a purely theoretical inconvenience as, in most cases, the districts coming into consideration from these various points of view will be the same.

In connection with the spatial distribution of agricultural population, the groundwork will be constituted by the general statistical surveys of the statics and dynamics of the distribution of agricultural population and of the different aspects of its economic situation. Local studies will have to be carried out in connection with the situation of the agricultural population in the districts coming under consideration because of the prevalence there of such phenomena as absolute or relative agricultural overpopulation, open or latent unemployment etc. In connection with such studies the results of farm accountancy of the districts concerned, as well as representative budget investigations, may prove exceedingly useful. Economic research will have to investigate the general conditions of economic location in the districts, in order to find out what particular measures might prove most effective in combating the evils by which it is affected. According to the results of such investigations, it will be possible to decide whether the situation of the agricultural population may be improved by the development in the locality of industries, by the improvement of transport which would open the way to new markets, or by some other means which would leave the existing population on the spot, or whether the only solution lies in the bodily transfer of some of the population elsewhere, by way of internal colonization.

Apart from the work of research in connection with these local problems, which will necessarily have to be carried out in the several countries, there will be a vast domain open for international investigation, in which the effects of national policies upon the distribution of agricultural production in the world will have to be studied. While the local studies carried out in the different countries will pursue primarily practical objects, these international studies, at first sight, will seem to possess rather an academic than a practical interest. But this will be only an illusion, as in the planning and the carrying-out of their national policies, which will necessarily involve a consideration of their international economic relations, the several countries will not be in a position to dispense with a knowledge of the conditions and trends in the rest of the world of which they are constituent parts.

The first problem in this connection to attract the attention of the investigators in the international field should be that of the changes in the location of the different branches of agricultural production brought about by the recent development of economic regionalism, which, as we have had occasion to point out, would appear to be tending to the substitution of several regional or imperial "isolated States" for the world-wide "isolated State" of the period of competitive world trade.

INTERNATIONAL CHRONICLE OF AGRICULTURE

HUNGARY

SUMMARY: General situation. – Foreign trade. – Measures relating to the marketing of agricultural products. – Index-numbers of wholesale prices and of cost of living in Hungary. – Agricultural production policy. – Agrarian structure. – Work of agricultural organizations. – Agricultural co-operation. – Agricultural credit. – Rural social policy.

General situation.

The last chronicle published in this Review concerning the agricultural situation in Hungary [1] concluded with the conditions existing in the summer of 1940. It also dealt, however, with the changes in the country's economic structure resulting from the restitution to Hungary, in September, 1940, of Northern Transylvania.

During the second half of 1940, the country's economy was dominated by the political situation in this connection and agricultural production in particular suffered from its inevitable repercussions. Among the chief disadvantages registered was the shortage of labour and draught animals due to the partial mobilization which lasted three months. It is true that this shortage was felt only in some regions of the country, but in these areas it considerably increased the already serious difficulties encountered in the work of harvesting and later in field work due to bad weather conditions. On the whole, however, the recovery of this relatively extensive territory had subsequently a stimulating effect on the nation's economy.

During the winter and spring the hope of a good harvest was reduced by exceptionally severe floods which submerged a million cadastral jochs of land, most of which agricultural. As a result of these floods the capacity of resistance of the nation's economy was severely tried in other fields also.

In the spring of 1941 the regions formerly incorporated in Jugoslavia were also returned in part to Hungary. The fertility of the soil of this land undoubtedly contributed towards a considerable expansion of Hungarian economy.

Meanwhile the duration and the extension of the war were increasingly felt. Consequently, at the present time Hungarian industry (judging at least from the number of workers employed), is passing through a period of definite crisis, while at the end of the first year of war there was a danger that factories would have to close down owing to lack of raw materials. This presents certain advantages, from the social standpoint for instance, although the improved earnings do not find its counterpart in an increased supply of merchandise. On the other hand, however, agriculture, which has to meet the greater part of the growing requirements of the military forces in men and horses, encounters serious difficulties in maintaining production, especially since the mechanization of farms is also rendered difficult by the war.

In the last chronicle we described the changes in the structure of Hungarian economy resulting from the return to the country of parts of Transylvania. The recovery of the regions formerly incorporated in Jugoslavia brought about an extension of area amounting to 7 per cent. and an equal increase in population. The advantages accruing

(1) January, 1941

to agriculture were greater, because the arable land resulting from this recovery increased by 10 per cent., while the increases in wheat and maize cultivation were 16 and 20 per cent. respectively. These percentages in themselves give an idea of the agricultural production of these regions. It may be added, too, that in the recovered areas, besides the two chief crops, hop-growing is fairly extensive while the hemp produced in the Bàcska area is world-famed. Since the yields in these areas are considerably higher than those within the frontiers fixed under the Trianon Treaty, it may be estimated that the future increase in the Hungarian wheat and maize yields will be still higher than that of the corresponding crop areas. On the other hand, the regions which have now been recovered by Hungary are very poor in forests, although there are more trees in the non-wooded areas there than in the low-lying plain situated beyond the Tisza. Industry, too, is of little importance in this area.

During the economic year 1940-41, weather conditions were, on the whole, very unfavourable, the same may be said for the first half of 1941-42. This period was characterized by lack of heat, abundant rain and long cold winters. As a consequence, there were exceptionally severe floods and, in the low-lying plane, underground water also caused heavy damage to the crops, sometimes even arresting growth. The beginning of the summer of 1942 which, in some parts of the country, was extremely fine, did not succeed in fully reparting the damage to autumn sowings from winter conditions, while it caused droughts in some regions which had been flooded until June, thus also damaging the spring crops there.

The 1940 harvest was accordingly very short, and the quality of all agricultural products was very poor. This was particularly evident in stockbreeding (damaged straw, insufficiently ripened maize, musty germinated barley). Both through livestock and directly as a result of the damage to bread-making cereals, human foodstuffs were also affected. The quantity of the following year's crops reflected the unsatisfactory conditions of the preceding season, both economic (late harvesting) and meteorologic-al (rains during the period of preparation of the land, extensive floods). On the other hand, the quality of the crops was fairly good. The year's harvest will hardly be better, at least as regards autumn cereals.

The movement, or rather the stabilization, of prices was at first favourable to agriculture: the price scissors closed completely during the year 1941. This does not, however, involve an improvement in the purchasing power of agriculture, because, on the one hand, farmers did not have much to sell during these two years and, on the other hand, it was not possible to establish a balance between wages and prices. Existing salaries may rather be said to have adapted themselves to the prices of those few commodities which did not come under or else escaped from price control. Thus at least a nominal improvement was observed in the income of those groups of the agricultural population in which cash wages for labour or haulage jobs play a more or less important part.

Foreign trade.

The publication of data concerning foreign trade has, of course, been much curtailed in Hungary as elsewhere. Only data concerning the value of foreign trade are now published. Thus it may be observed that for 1941 the total value of imports has increased by 21 per cent. and that of exports by 54 per cent. in comparison with the previous year. This increase may hardly be attributed, however, to the increase in territory, as this affected the degree of the country's self-sufficiency rather than its importance in international trade. Neither may this increase in value be considered as indi-

cating an increased volume, as the low yields obtained from the harvest in the two previous seasons affected the foreign trade of the current year. It must therefore be concluded that this increase in value is for the most part due to the rise in prices, and that, while the volume of exports had remained practically stationary, there was a diminution in imports.

Important changes are revealed by the study of the distribution of foreign trade according to products. Several agricultural products which were in the front rank of exports from the territory limited by the Trianon Treaty (wheat, lard and butter) have dropped considerably in importance, while others (pulse, fodder seeds, vegetables and fruits) have increased in importance. Thus hemp is exported from the Bàcska region and rock salt from the Eastern Carpathians (there were no rock salt deposits within the frontiers fixed by the Trianon Treaty). This is also true in the case of industry which, although it has lost several well-developed export possibilities, such as, for instance, rubber articles, has found, thanks to the progressive transformation of German industry into the manufacture of war material, many outlets, some of which quite unexpected, including the exportation of toys to Germany.

As regards the distribution of foreign trade according to countries of destination the shares of almost all the countries still accessible has, of course, increased, with the exception of the countries occupied by Germany in the west and north of Europe. Trade exchanges with Sweden in particular have shown a heavy increase. This rose from 0.2 per cent. of the total average value of imports from 1932 to 1934 to 2 per cent., while exports increased from 0.7 per cent. to 2.2 per cent. The changes registered in Hungary's relations with her principal trade partners may be seen from the following table:

Shares of the various countries in Hungary's foreign trade.

	Imports				Exports			
	Annual average 1936-38		1941		Annual average 1936-38		1941	
	in million of pengoes	%	in million of pengoes	%	in million of pengoes	%	in million of pengoes	%
Total value	443.6	100	730.1	100	538.3	100	791.1	100
Germany	121.1	42.9	429.5	58.8	133.7	43.0	474.9	59.8
Austria	68.7				101.8			
Italy	30.7	6.9	150.2	20.6	60.6	12.3	113.8	14.4
Switzerland	10.3	2.3	20.8	2.8	23.9	4.4	64.3	8.3

Measures relating to the marketing of agricultural products.

The object originally pursued by the government was to prevent the expected rise in prices, especially in the case of commodities of prime necessity. For this reason, as early as the outbreak of hostilities between Germany and Poland, the prices were blocked, and this measure was maintained for some time. Later, however, the government was compelled to authorise an increase in the prices of certain commodities which are only subject to control, while in the case of other goods prices had to be adjusted to those of agricultural products which had, for the most part, been fixed officially. Consequently there occurred the closing of the prices scissors mentioned above. In the autumn of 1941 a general scheme of regulation of prices was undertaken, aimed at

maintaining the balance of the price system including an adjustment of salaries and of official wage rates. Since then no rise in prices has been permitted unless under exceptional circumstances and in the list of prices of agricultural products published in July 1942 for the current economic year, increases are allowed only for articles whose production it is desired to encourage. The evolution of prices may be seen from the following table.

Index-numbers of wholesale prices and of cost of living in Hungary.

	August 1939	July 1940	December 1940	July 1941	December 1941
Products of agriculture and animal husbandry	100	121	142	149	170
Products of agricultural industries	100	107	116	117	164
Industrial products	100	112	118	128	150
General index	100	114	126	134	159
Cost of living index	100	107	115	120	138

Index-numbers of wholesale prices and of cost of living in Hungary.

In drawing conclusions from these figures, however, account must be taken of the fact that the first necessaries of mass consumption are as a rule available only in insufficient quantities and also that the quality of many of the products used for calculating the index has altered while in the case of other items (such as rents), the figures on which the index is based apply only to certain given cases.

The system of price controlling operation may briefly be described by saying that wages and salaries are officially fixed and that the wholesale prices of commodities are based upon these elements to which are added officially approved margins.

Agricultural production policy.

The 1940 harvest was bad, particularly as regards quality; that of 1941 was better, at least in this respect. These facts, together with the restrictions introduced in 1941 concerning fodder consumption, as well as some mistakes made in the price policy, were reflected in the returns obtained from livestock. Some confusion arose here, particularly in connection with supplies of milk, eggs and fats. On the other hand, an intelligent price policy led to a revival of the farmers' interest in wool production. Thanks to the prompt introduction of restrictions in connection with meat consumption (meatless days), it proved possible on the whole to avoid difficulties during the period under review; difficulties in this respect have only recently begun to appear.

In order better to understand the unsatisfactory conditions of the past few years, it should be recalled, although this does not belong to the sphere of agricultural production, that the extremely severe winters of 1939-40 and 1941-42, as well as the unfavourable conditions prevailing during the breeding periods in 1940 and 1941, destroyed large numbers of small game thus causing the loss of between 50.000 and 60.000 quintals live weight of animal foodstuffs in the territory fixed by the Treaty of Trianon.

In agricultural production a severe diminution in the cultivation of tobacco has taken place during the past decade. One of the chief results of this was that tobacco

of inferior quality, which constituted the greater part of production and of which there was a surplus, could not be exported abroad during the years of depression by the Tobacco Monopoly except at severe loss. Consequently, the Tobacco Monopoly was obliged to restrict its production in spite of active and efficient propaganda encouraging the use of products manufactured with nicotine in the anticryptogamic campaign. However, in the areas suited to tobacco cultivation it is difficult to find a substitute for this crop which would meet the needs from the social and economic points of view, apart from the fact that marketing conditions have considerably altered. This is why the average purchase price paid by the Monopoly was increased by 30 per cent. in the autumn of 1940, while bonuses for the encouragement of tobacco growing were introduced in the following year. This time, however, the chief aim is to extend the cultivation of the choicer varieties of tobacco.

In order to increase the supplies of vegetable oils, compulsory cultivation of oil seeds has been introduced for the first time during the period under review. In 1914 only farms wich had previously cultivated the castor oil plant were subject to this compulsion. During the current year, however, compulsion was extended to all farms; small farms were obliged to surround their maize fields with sunflowers, while farms with an area exceeding 28 hectares were compelled to plant sunflowers, flax, soya or castor oil plants on 5 per cent. of their arable land. The only oleaginous plant cultivated by the peasants, up to the present, was the poppy, and this was chiefly grown for household consumption. Sunflowers were grown on a larger scale in certain areas and the Transylvanian Romanians have always used sunflower oil for food. On the larger farms with good soil the cultivation of rapeseed was generally widespread, while the poppy was also grown on a smaller scale in many areas. Sunflowers were also grown in some regions. As a result of government propaganda flax for seed and castor oil plants have been cultivated on the large farms for about fifteen years. The history of the cultivation of the soya bean in Hungary is still more recent. Since experts have been engaged in the selection of the most useful varieties of these foreign plants for about the same length of time, it may be hoped that the more common crops which have been displaced by the cultivation of oleaginous plants have not been sacrificed for nothing.

The improvement in seeding material, which made great progress both during and after the depression, is being continued under government supervision.

Turning now to the measures adopted by the government for the encouragement of animal husbandry, mention may be made of the decision taken by the Minister of agriculture in 1940 concerning the distribution on easy terms to small farmers of pure-bred calves to be reared to a fixed age; the purpose of this measure was to obtain a rapid extension of stockbreeding among the peasants.

As a result of certain alterations in diet and also of some unintentional effects of the measures adopted in connection with the marketing policy, it was feared that farmers might be led to reduce their livestock in pursuit of temporary advantages. In order to avoid this, in October, 1940, the slaughter of heifers less than a year old was prohibited in some regions (including the best stockbreeding areas); in August, 1941, the prohibition was extended to heifers and cows less than 4 years old and applied to the whole country; a similar prohibition was issued for all ewe lambs and ewes under 4 years of age. If the animals are ill or of unsatisfactory constitution, or if they are unsuitable for breeding, the prohibition is annulled by the local agricultural authorities.

The Law No. XIII promulgated in 1940 aims at the general improvement of peasant stockbreeding. Up to the present the purchase and maintenance of communal breeding animals which constitute one of the most important elements in the quality of peasant stockbreeding, was handled by the communal administration. This system did not gua-

rantee the desirable progress in peasant stockbreeding as the commune's economic position, personal motives, questions of responsibility etc., played too large a part in the choice and purchase of breeding animals. This is why the law provides that the comitats and independent towns are to establish a fund with existing sums or sums allocated for their use, as well as with sums obtained from sources of revenue newly created by law (in the first place by a tax to be levied from owners of livestock); the law also provides that, as from 1945, the purchase of communal breeding animals and other expenses for the improvement of communal stockbreeding shall be paid out of this fund. Besides the government organs of agricultural administration a place corresponding to their importance in the administration of this fund is assigned to the stockbreeding associations as well as directly to the farmers concerned.

Among the measures affecting agriculture as a whole, mention may be made of the provision completing the decree, issued in 1938, concerning assistance in farm work. Under the terms of this decree, any farmer could be called upon to take part whith his team in the necessary ploughing of fields for those of his neighbours who had been called to the colours. At the present time this measure has been extended by the introduction of a compulsory form of assistance in the usual work of the *szeklers*. The decree of 1938 has also been extended to owners of draught animals or tractors who are professionally engaged in agricultural work.

In 1940 part of the fields was still flooded as late as September. In order to hasten the drainage in cases where the waters had to be diverted through land owned by others, provision has been made that the long judicial procedure usually required in these cases may be replaced by a more rapid administrative procedure.

In order to improve the peasants' standard of living the government has also undertaken a programme for the construction on small farms of silos, maize granaries and model manure pits. The State generally contributes a sum equal to the cost of the necessary material. Since the object of this plan is chiefly to set an example, two to four manure pits at the most per commune are subsidised according to its size. (It should be remembered that in Hungary there are communes inhabited by a dense population of 10,000, 12,000 and even 20,000 inhabitants all engaged in agriculture). By the end of 1941, 3,000 of these model installations had been completed. Since there are 7,000 communes, there still remains much to be done in this respect.

As regards the development of agricultural efficiency, the vocational courses recently instituted by the Government for the training of permanent farm labourers will contribute largely to this objective.

The most important event in the field of agricultural legislation during the period under review is the bill "for the encouragement of agriculture" announced in the autumn of 1941 and now before Parliament. The law will comprise, systematically arranged, a whole series of measures directed towards this end. The bill does not, however, aim at introducing a system of compulsory planned economy, as the competent Minister recently expressly stated, and an attempt will be made to attain the desired end by extending instruction, giving advice and offering bonuses and prizes. Formal intervention in the management of the farms will be confined to extreme cases.

In order to extend technical knowledge, all educational establishments, beginning with the winter farm schools, will be enlarged and their activities extended. Strictly speaking, the recently introduced prolongation of elementary education from six to eight years may also be considered as forming part of this reform, since it has been introduced mainly in connection with agricultural instruction. Model farms will also be created in each commune, as production competitions and excursions, as well as the establishment of bursaries are also contemplated.

The development of agricultural administration will in the first place be completed in each commune by the appointment of expert farmers (communal economic supervisors) who will be responsible for the diffusion of informations concerning the measures adopted in the interest of economic progress and for the control over their execution. It is expected that these posts will be filled by peasants' sons who have already received the necessary technical training; in other words, as far as possible, these posts will be allotted to persons resident in the locality. These subordinate bodies of agricultural administration will be supervised by the managers of the district experimental farms, which in their turn will be selected from among the best farms in the district.

The bill also contemplates:

the encouragement of agricultural industries, including home industries;

the encouragement of land improvement by means of prizes;

the acceleration of the consolidation of holdings, in connection with which much still remains to be done in most regions of the territory which did not come under Turkish rule, in spite of the law on consolidation promulgated seventy years ago which, it is true, was based on the juridical ideas of the period.

The following measures may be considered as possibilities contemplated by the authorities in connection with the planning of economy:

(1) The government will be authorised to encourage farmers to introduce certain types of crops and stockbreeding on their farms, as well as certain farming methods.

(2) In order to help the disposal of production, the government will be authorized to encourage the formation of agricultural associations and to control markets.

(3) Farms to which prizes have been awarded will be advised to adopt scientific systems for their management and to keep accounts.

One thousand million pengoes over and above the normal budget will be appropriated during the next decade for the carrying-out of this programme which, besides the measures recorded above, naturally contains many other details. The normal budget for the present territory of the State and at the present price level may be considered as amounting to between 70 million and 80 million pengoes a year.

Agrarian structure.

The long-drawn discussion concerning the distribution of landed property most favourable to national progress appeared to have been decided in favour of the small holder in consideration of unemployment, of the greater resistance of the small farm to depression and also, to a great extent, under the influence of "investigators into the conditions of rural life", whose chief aim was to make a serious study of the social and demographic aspects of the problem. The result, after careful study, was the drafting of Law No. IV, 1940. During the period of its preparation there was much discussion of this draft as a new law of agrarian reform. But in its final form it was called "Law on the constitution of small tenancies", which shows that it represented less a change in the distribution of property than, in accordance with the needs of the nation's life, a change in the control of landed estate and in the system of management. Under the terms of this law some 1.2 million hectares, or 18 per cent. of the arable area then available in the country, were to be ceded to the peasants by the large landowners for the purpose of creating small tenant farms. This law was mentioned in our last chronicle. Here we will merely add that in the first eighteen months after its promulgation some 240,000 hectares were made available under the terms of the law. Its further enforcement seems, however, to be somewhat impeded by war conditions. Moreover,

the creation of independent agricultural units is probably less urgent now than it appeared a few years ago.

The law promulgated during the current year concerning the expropriation of landed property belonging to persons of the Jewish race is a new legislative measure in agrarian policy. It affects about one million hectares of estates expropriated in exchange for medium term bonds which the holders, however, are not free to dispose of at the present time. A comparison of the conditions of this measure with those of former land expropriations shows that they are considerably more favourable to the owners than, for instance, those made to former Hungarian owners by the States created under the Trianon Peace Treaty.

Work of agricultural organization.

The Chambers of Agriculture which are the legitimate representatives of the interests of Hungarian agriculture are becoming increasingly active along with the gradual extension of State economic control. Since the last chronicle was published their organization has remained unchanged. The only difference registered since consists in the fact that it has been decided not to constitute a special chamber in Transylvania, the Hungarian association of agriculture in Transylvania, which continued to exist under Romanian rule, having been appointed to act in its stead.

Agricultural co-operation.

The importance in trade of co-operative societies is steadily increasing thanks, on the one hand, to the growing centralization of the distribution of commodities and, on the other, to the efforts made to transfer trade into the hands of Christians. This is especially true if we consider as co-operative societies in the real sense of the term the organisms constituted for co-operative trade in many foodstuffs.

The importance of co-operative societies in retail trade has also increased chiefly as the result of the antisemitic measures mentioned above. It is true that so far no measure has been taken forcing Jewish retailers to close their shops or to have them transferred to Christians. But the gradual withdrawal from Jewish trade of articles subject to government monopoly or, for the duration of the war, to distribution by the authorities, naturally encourages purchasers of other articles to deal with the shops where they find the articles in question and, consequently, in rural areas, with the co-operative shops. Nevertheless, unfortunately it cannot yet be that the real understanding of the co-operative idea has made any considerable progress.

Agricultural credit.

The outstanding event in this field was the abolition on December 31, 1941, of the measures adopted in 1932 for the protection of debtors. As from that date only those agricultural debtors are protected whose right to the adjustment of their debts was recognized under the terms of former regulations and in whose case the corresponding procedure is still in course of application, as well as those in whose case measures of protection have been prolonged for special reasons. It would appear that the only consequence of the abolition of protection for those concerned will be an increase in the interest payable no forfeiture being provided for.

With a view to increasing the supply of capital for agriculture, the National Bank has guaranteed the agricultural credit institutions a credit margin of 50 million pengoes on condition that out of this fund medium term loans be granted to farmers.

The conditions governing these loans are quite favourable: they do not fall due before the lapse of a term of at least fifteen years, interest is fixed at 1 ½ per cent. above the discount rate, and they are covered by bonds instead of bills of exchange. But the other conditions of the loans exclude most of the farmers and particularly those who have the greatest need of credit. In fact, loans are only granted on debt-free estates to only a small part of their value and cannot be used except for new investments.

Rural social policy.

As we have already given to understand, the constant surplus of agricultural workers existing in former years disappeared completely during the period under review, yielding place to a marked shortage of farm labour. Since one of the causes of this phenomenon, industrialization (the other being the extension of military service), is gradually spreading to the rural districts, farm labourers are increasingly enabled to adjust the wages they demand to those paid in industry. But as this evolution is threatening the stability of the agricultural price system, the Government has been compelled to attempt to fix agricultural wages.

A long-term action has been started under Law No. XXIII, 1940. Under the terms of this law a "Fund for the protection of the nation and the family" has been created for the purpose of helping large families to build family houses, purchase livestock and implements for home industries, as well as to purchase and equip small allotment holdings.

Simultaneously the provisions of Law No VI, 1940 (law concerning small tenancies) have been put into operation in so far as they affect the purchase of building lots. Under these enactments the communal authorities are charged with all the necessary measures for helping the inhabitants of their communes who are anxious and able to build a house to purchase the necessary land. As far as possible the land must be purchased by freely concluded agreement, and where this is impossible, by the application of the right of compulsory government purchase as provided for under the existing laws.

Only a year has passed since the enactment of these two laws, but it is already possible to see that they are not mere empty formulas, as in nearly every village groups of houses are to be found whose construction they have rendered possible.

Dr. Karl IHRIG and Gabriel v. HERSELENDY

BIBLIOGRAPHY ON ECONOMIC AND SOCIOLOGICAL SUBJECTS

LEBENSRAUMFRAGEN EUROPÄISCHER VÖLKER. Herausgegeben von Prof. Dr. K. H. Dietzel, Prof. Dr. O. Schmieder, Prof. Dr. H. Schmitthenner. Leipzig [1941]. Bd. I: Europa. Bd. II: Europas koloniale Ergänzungsräume.

The above work is planned to appear in six volumes: so far only the two first have been published dealing with Europe and the complementary colonial spaces belonging to Europe. A third volume on the problems inherent to the vital space of the German people is in course of preparation. The other three volumes will describe the geographic foundations of the new organization in the Far East, and of the present problems in the New World and in the East. This is a sound piece of work presented most attractively and is the result of the collaboration of eminent German geographers each of whom has contributed a separate article on the problems in which he is specialized.

The volume opens with studies concerning the limitation of the earth's productive capacity, the part played by the vital spaces in the struggles of peoples and of civilizations, the migratory movements governing the shifts of the European populations and the importance of the Atlantic fishing areas in the food supply of European peoples. Northern Europe is then discussed, with particular regard to the exploitation of the Finnish and Scandinavian mines and their importance for Europe, the agricultural colonization and forestry problems in the Northern countries and the agricultural and geographical situation of Denmark. The work then deals with the British Isles, describing the demographic structure of the country and the productive capacity of its agriculture. The other chapters of this section discuss the importance of the evolution of British industry, the British Isles, the British Empire and the Irish problem. In another section there is a study of the Dutch and French vital spaces. In the section entitled "The Mediterranean space" the authors of the different chapters study the vital spaces of Spain and Portugal, the relations between Italy and North Africa and the Greek vital space in both ancient and modern times. This is followed by discussion of the vital spaces belonging to countries of South-Eastern Europe, namely Slovakia, Hungary, Romania, Bulgaria and Jugoslavia (this last appears as a supplement to the second volume).

While the first volume deals with the problems of the vital spaces of the European peoples in all their various details: present and potential production and population within the framework of European economy as a whole, the experts who have prepared the second volume make an objective and extremely interesting study, on the one hand, of certain problems concerning Europe's complementary spaces, with special reference to the tropical regions, from the standpoint of living and labour possibilities for Europeans, treatment and employment of natives, choice of systems of tenure (large, medium-size and small farms, direct operation and tenancy), and, on the other hand, of questions concerning the orientation of native production, the substitution of mixed cropping for the single-crop farming, the conservation of forest reserves, etc.

The first section of a general character in this second volume contains articles on the colonizing qualities of the German people and the results obtained by them, the work of German geographic science which has laid down the lines of German colonization (retrospective review and future prospects) and the services rendered by the German geographic Museum to colonial activities.

This is followed by a section entitled "Problems of colonization" containing the following studies: Acclimatization and colonization—Farming and soil destruction (erosion, etc.)—Trends affecting the structure of tropical agriculture—Transformation of colonial farming in Africa and its situation—Tropical Africa. Landscape, climate, vegetation. The native population. Problems of colonization—The African shores of the Red Sea and their political destinies—Exploitation and protection of forests in tropical West Africa—Native crops in the humid areas of the West African tropics. South African problems—The Portuguese colonies in Africa—Extension of the European vital space to the New World. The United States—Migrations between the two continents and German emigration to owerseas countries in particular. The German rural population in South America—Arabia and its colonial irradiations, geographical and historical study—Changes which have occurred in the structure of colonial economy of the tropical regions in the Pacific—The Pacific and Germany.

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OF

AGRICULTURAL ECONOMICS AND SOCIOLOGY

THE DECLINE OF THE POPULATION OCCUPIED IN AGRICULTURE, ITS CAUSES AND ITS ECONOMIC AND SOCIAL EFFECTS

by Dr. HUGO BÖKER.

SUMMARY: I. The evolution of the number of population gainfully occupied in agriculture and forestry in various countries: *Comparability of the results of occupational censuses. The development in the different countries: Germany, France, Great Britain, Italy, Canada, United States of America, Argentina, Australia and New Zealand, Japan. Absolute or relative decline of the population gainfully occupied in agriculture as a result of the flight from agricultural occupations.* – II. Why do people abandon agriculture? *The individual causes. Earlier explanations of the abandonment of agriculture as world-wide phenomenon. The uneven development of the productivity of labour in agriculture and of the demand for agricultural products as the general cause of the abandonment of agriculture. The evolution of the productivity of agricultural labour. The evolution of the demand for agricultural products. Productivity of agricultural labour, demand for agricultural products and number of persons gainfully occupied in world agriculture.* – III. The effects of the migration from agriculture on the agricultural population and on national economy: *The consequences for those leaving agriculture. The consequences for the remaining agricultural population. The consequences for national economy.*

The rural population, ever since the early beginnings of modern industrialism, has constituted the main source from which the industries and crafts have drawn the necessary reserves to complete and renew the ranks of the gainfully occupied population. As industrial activity became increasingly concentrated in certain areas, there resulted in many countries a migratory movement which greatly exceeded in extent all previous movements of the population. In a recently published article [1], it was shown that this led to the progressive concentration of the population in the towns, industrial districts and large cities. The more marked the progress of this evolution, the more the rural migratory movement townward became in time a necessity even for maintaining the numbers and health of the urban population

The migratory movement towards the towns drew upon all rural occupational groups. At first, as the concentration of industrial occupation caused the disappearance of many undertakings run by rural craftsmen and of numerous other small concerns, the non-agricultural occupations, whose birthrate at that time was still high, may here and there have provided the chief source of the

[1] BÖKER, H.: The progress of urbanization in the world. In the April, 1942, issue of this *Bulletin*.

cityward stream. In the course of time the agricultural element gradually prevailed everywhere. On the other hand, with the establishment of industry in purely rural areas and the formation of numerous new industries for the transformation of agricultural products, together with the consequent improvement in means of transport which, moreover, enabled workers to live at a distance from their work in the towns, the migration from agriculture to other occupations without change of residence became increasingly important.

The passage from agriculture to other occupations has developed to such an extent since the end of the last century in many countries that in the course of time the number of persons gainfully occupied in agriculture decreased not only relatively—in relation to the total population gainfully occupied— but absolutely as well. A stationary condition or even an absolute decline in the agricultural population became a common phenomenon in all the economically advanced countries.

What was the course of this evolution, how did it originate and how should it be judged? These are the questions which will be analyzed in the present article.

The considerations which follow are therefore intimately connected with the previous article dealing with the continuous progress of urbanization in the world; they complete it in some essential aspects although starting from a different point of view.

I. — The evolution of the number of population gainfully occupied in agriculture and forestry in various countries.

Any comparison over a period of time of the results of occupational censuses in a single country, as well as any international comparison of occupational statistics is subject to numerous limitations. In order to prevent misunderstandings, it would appear advisable, before giving any figures, to explain briefly the most important definitions of occupational statistics as at present available, as well as the limitations to which they are subject when establishing any kind of comparison over a period of time or from an international standpoint.

Comparability of the results of occupational censuses.

Grouping of total population in occupational statistics. — Data concerning the occupations of the people, usually collected at the time of population censuses, are compiled in the various countries according to two different systems [1].

The first system consists in grouping the total population according to its dependence on the various occupations. A distinction is frequently made between principal occupation and secondary occupation and in this case classification according to the various branches of activity is often made only for persons

(1) See: STATISTICS OF THE GAINFULLY-OCCUPIED POPULATION. League of Nations, Geneva, 1938

engaged in a principal occupation. Most census publications permit the division of the population into the four following groups:

(1) persons engaged in a principal occupation;

(2) independent persons without a principal occupation;
(3) members of the family without a principal occupation;
} persons without occupation;

(4) persons depending on the different economic branches or on the different occupations.

In countries where the second system has been adopted, the statistical data refer more or less to the gainfully occupied population alone, while the information concerning the population not gainfully occupied is very summary.

Definition of the most important terms. — A certain uniformity has been attained in connection with the definition of the most important terms. Thus the following persons are usually considered as *persons gainfully occupied*: persons who, on the day of the census, are exercising an activity as independent persons, officials, employees, workmen, domestic servants or members of the family assisting the head of the family in the exercise of his occupation, no matter whether, at the time of the census, they are actually occupied or whether, due to holidays, sickness, accident or lack of work, they are not actually working. Work done by women in their own homes or any form of honorary work are not considered as occupations.

In many countries, all persons exercising an occupation, without regard to age, are considered as persons gainfully occupied, while in other countries, classification in groups of gainfully occupied persons presupposes a given age. No age limit is fixed in this respect, for instance, in Germany, Belgium and France, while in Great Britain, Italy, the United States of America and Canada, occupational statistics include members of the population of the age of 10 years and over. In Norway and Sweden on the other hand, only persons of 15 years and upwards are included. These differences may have a certain importance, especially in the case of a comparison of the number of persons gainfully-occupied in agriculture, because the proportion of young persons gainfully-occupied in agriculture is almost always greater than that of young persons engaged in other branches of economic activity.

Those persons generally considered as *independent persons without occupation* are all those who are not engaged in a principal occupation (or who are not engaged in any occupation) and who live on the income from their estates or capital or on a pension, subsidy, etc.

The following persons are considered as belonging to the group of *members of the family* (or else members of the family without a principal occupation): persons living in the household of a person gainfully occupied or of an independent person without occupation and on whom they are economically dependent. In this case these persons are mainly children compelled to attend school, married women, daughters and other members of the family engaged in the work of their own household.

The group of *persons depending on an occupation* includes gainfully occupied persons with the members of their families not engaged in a principal occupation. Persons gainfully occupied in agriculture including the members of their family not engaged in a principal occupation, persons depending therefore on agriculture, are usually classified simply as agricultural population. Data concerning this agricultural population in the broadest sense of the term are only available for those countries which have made a classification of the total population in their occupational statistics.

Grouping of persons gainfully occupied. — The grouping of the persons gainfully occupied as registered in a census may be arranged according to the kind of *establishment* in which they exercise their occupation or, when dealing with unemployed persons, in which they exercised it while employed, or else according to individual *occupation*. In many countries occupational statistics group gainfully occupied persons according to both these methods.

In the case of *grouping according to the kind of establishment*, all gainfully occupied persons in an establishment are grouped in the branch of economic activity to which the establishment belongs. Thus, for instance, all persons gainfully occupied in crop-growing are grouped in the branch "crop-growing". Several branches of economic activity (as, for example, crop-growing, stock-breeding, horticulture, vine-growing, and similar branches), are as a rule taken together as an economic group (agriculture), and several economic groups (as, for instance, agriculture, forestry, hunting and fishing) as an economic section (agriculture and forestry).

When *grouping is arranged according to individual occupation*, each person gainfully occupied is classified according to the occupation indicated. A blacksmith, a wheelwright, etc., employed in agriculture, does not appear in the group of agricultural occupations, but in the group of persons engaged in the corresponding trade. As in the case of the first grouping, here again, the occupations are collected into occupational groups and the occupational groups into occupational sections.

Difficulties encountered in making international comparisons. — International efforts made over a long period in order to obtain greater uniformity in the methods adopted in the compilation of occupational statistics, have doubtless made it possible to reach considerable results, but it goes without saying that the progress made in this direction has been unavoidably very slow, in the first place because occupational censuses are taken only at more or less long intervals, and, in the second place, also because the several countries, when adopting uniform methods, are hampered by serious obstacles deriving from numerous special conditions and from the particular aims for which the censuses were taken. Consequently, even today, no international comparison can be made without numerous qualifications because the definitions, the census methods and the system of classification generally differ. Comparable figures may often be obtained, however, by means of calculation. In other cases, calculation is impossible or can only be made by the statistical offices on the basis of the unpublished original material at their disposal.

Whether the persons gainfully occupied are grouped according to the industries in which they are engaged or whether they are classified according to their individual occupation is generally a matter much less important for the section of "agriculture and forestry", than for the other sections. In those cases in which the classification is made according to both these methods, as is done in many countries, the results for agriculture and forestry, as an economic section or as an occupational section, usually differ but slightly.

The most serious obstacle encountered in making an international comparison of persons gainfully occupied in agriculture undoubtedly depends upon the *differences in the definition of occupation in agriculture.* In almost every country it is the custom, particularly on the peasant farms, for the family to share in the agricultural work. The extent of this collaboration is subject, from one individual case to another, to considerable variation and it is very difficult to give precise instructions concerning the attribution of these persons to the gainfully occupied population (*i. e.* as members of the family assisting the head) or to the group of members of the family without occupation. Similar difficulties are encountered when attempting to classify servants occupied in the household of a farm who, at the same time, share in the agricultural work. In order to avoid these difficulties, very different systems have been adopted by the statistical offices of the various countries. Some countries, for instance, have chosen a radical solution and consider all wives of farmers as gainfully occupied persons; other countries, on the contrary, consider them as persons without occupation. In studying many social problems, these difficulties may be avoided by starting from the number of persons depending on agriculture instead of starting from the number of persons gainfully occupied. Unfortunately, in the case of international comparison, this possibility is limited, as a considerable number of countries do not group their total population according to branches of economic activity, or to occupational groups.

Difficulties encountered in making a comparison over a period of time. — Similarly to international comparison, the comparison of the results of several consecutive occupational censuses for the same countries has its limitations. The difficulties encountered in the comparability of these results may be due in the first instance to the fact that the frontiers of the country have undergone changes, or that the censuses have been taken under completely different economic conditions or at different seasons. But comparability is influenced chiefly by the fact that, from one census to another, the methods used in taking the census and in classifying the results may have undergone considerable changes. Particularly in the case of agriculture, these changes affect, more than any other group, the group of members of the family assisting the head of the family, and, above all, its female members. One can never be sure whether the changes in the numbers of this group are the result of a different classification or whether real numerical changes have occurred.

The development in the different countries.

For the reasons given above, Table 1 can include only those countries for which synoptical tables concerning the evolution of the occupational composition of the population have been found in official or in other authoritative publications. It

is true that the number of countries thus included is small, but they are so distributed as to make their economic evolution fairly representative of that of the national economy of many other countries and, to a certain extent, of the general evolution of economic activity. Table 1 thus makes it possible to follow the approximate progress of the development of agricultural and forestal occupation in the countries for which we give, in table 2, the occupational situation according to the last occupational census. The absolute figures contained in Table 2 as well as the data used as a point of departure for the calculation of the relative figures of this Table are, in so far as possible, reduced to a uniform basis by seeking to delimit as much as possible the gainfully occupied population in the sense of the definition given above.

Since in the official statistics of almost all the countries included in Table 1, only retrospective data are found concerning the section " agriculture and forestry " (*i. e.*, agriculture, forestry, hunting and fishing), it was unfortunately impossible to give an outline of the evolution of the number of persons gainfully occupied in agriculture properly so-called (crop-growing, stock-breeding, horticulture, vine-growing, silkworm rearing and other similar branches of economic activity). For the purposes of the present article, however, these figures have more or less the same value; forestry, hunting and fishing, in fact, account for but a small part (1) of the total gainfully occupied population in the " agriculture and forestry " section, so that agriculture properly so-called determines practically the whole of the evolution.

Germany.

The total number of persons gainfully occupied in Germany (territory as of January 1, 1938, not including the Saar), has more than doubled during the period 1882-1939. From 16.9 million in 1882, the year in which the first occupational census was taken, the number rose to 34.3 millions in 1939. This increase was due mostly to a natural increase in population, but the share of gainfully occupied persons in the total population also increased considerably. In 1882, they represented 42.4 per cent., in 1925, 51.3 per cent., in 1933 49.5 per cent. and in 1939 50.0 per cent. of the total population. Nevertheless, the change in the occupational quota was in part the result, on the one hand, of a different classification of occupations and, on the other, of the fact that the censuses were taken under different economic conditions.

The increase in the number of persons gainfully occupied was distributed unequally over the various economic sections. In absolute figures the increase was greatest in industries and crafts (from 6.0 million in 1882 to 14.4 million in 1939);

(1) Thus, according to the latest census taken in Germany, 2.1 per cent. (4.1 per cent. of the male population gainfully-occupied in "agriculture and forestry "); in France, 1.6 per cent. (2.6 per cent.); in Great Britain, 5.1 per cent. (5.2 per cent.); in Italy, 1.6 per cent. (2.1 per cent.); in Canada, 7.5 per cent. (7.6 per cent.); in the United States of America, 2.5 per cent. (2.7 per cent.) ; in Australia, 6.9 per cent. (7.1 per cent.) and in New Zealand, 7.9 per cent. (8.1 per cent.).

in relative figures, on the contrary, it was greatest in trade and the communications (from 1.4 million in 1882 to 6.0 million in 1939). Next, in relative figures, came the increase in the "public and private services" section, in which the number of gainfully occupied persons rose from 984,000 in 1882 to 3.6 million in 1939. The increase took place, therefore, almost exclusively in the non-agricultural branches of economy.

Out of the 17.4 million gainfully occupied persons representing the total increase between 1882 and 1939, only 1.8 million persons actually worked in the section of agriculture and forestry. In 1882, agriculture and forestry still absorbed 42.3 per cent. of all persons gainfully occupied and consequently formed the most important economic section; in 1939 this figure had fallen to 26.1 per cent. The absolute number of persons gainfully occupied in agriculture and forestry reached its peak in 1925; after that date absolute figures also began to decline.

The situation appears even more unfavourable for agriculture and forestry if the distribution of gainfully occupied persons is considered according to sex. While in 1882, 41.3 per cent. of male persons gainfully occupied worked in agriculture and forestry, this figure fell in 1939 to 18.8 per cent., coming, consequently, well below the share of male and female persons gainfully occupied in agriculture and forestry in the total number of persons gainfully occupied. As early as 1882, the absolute number of males gainfully occupied in agriculture and forestry had reached its maximum. The increase which occurred in the following decades in the total number of persons gainfully occupied in agriculture and forestry was due to the great increase in female labour. Although, in the course of time, female members of the family were increasingly employed in agriculture, a certain percentage of the increase, perhaps even a very considerable portion, may have been accounted for merely by a different method of registration.

According to the available statistical data, the share of women in the total number of persons gainfully occupied in agriculture and forestry increased steadily, rising continuously from 30 per cent. in 1882 to 55 per cent. in 1939.

The decline in the number of persons gainfully occupied in agriculture assumes greater importance from the fact that this decline is also connected with a considerable change in the qualitative composition of the numbers in a different way. The tendency to abandon agriculture was particularly manifest among the classes of the most productive age. As a result, the percentage belonging to the age-group from 18 to 30 years, which was always smaller in agriculture than in the other occupations, dropped still further during the last decades. On the contrary, the percentage of the less productive classes, from 14 to 18 years of age, increased considerably, especially because the young members of the family were employed to an increasing extent in farm work.

German occupational statistics, besides giving information concerning the number of persons gainfully occupied in the different economic branches also contain figures concerning persons depending on the various branches. Since, in agriculture, the members of the family help the head of the family in his work to a greater extent than in other branches, and since, by the fact of this assistance, they are registered in the census as occupied, the number of "members of the

TABLE 1. — *The evolution of the number of the population*

Country and Census year	Total population			Total gainfully		
	male	female	total	male	female	total
	in thousands			in thousands		
German Reich (Territory as of 1-1-1938 not including the Saar) (*a*):						
1882	19,501	20,333	39,834	11,931	4,954	16,885
1895	22,499	23,426	45,925	13,855	5,901	19,756
1907	27,107	27,884	54,991	16,655	8,501	25,156
1925	30,197	32,213	62,410	20,531	11,478	32,009
1933	31,685	33,533	65,218	20,817	11,479	32,296
1939	33,487	34,987	68,474	21,569	12,700	34,269
France (*a*):						
1866 (90 Dept.)	19,014	19,053	38,067	10,500	4,643	15,143
1896 (87 »)	18,923	19,346	38,269	12,559	6,411	18,970
1901 (87 »)	18,917	19,534	38,451	12,910	6,805	19,715
1906 (87 »)	19,100	19,745	38,845	13,027	7,694	20,721
1921 (87 »)	17,599	19,503	37,102	12,531	8,313	20,844
1921 (90 »)	18,445	20,353	38,798	13,114	8,606	21,720
1926 (90 »)	19,309	20,919	40,228	13,556	7,838	21,394
1931 (90 »)	19,911	21,317	41,228	13,712	7,900	21,612
Great Britain (*a*):				(2)	(2)	(2)
1881	14,439	15,271	29,710	8,851	3,887	12,739
1891	16,003	17,025	33,029	10,010	4,489	14,500
1901	17,903	19,097	37,000	11,548	4,763	16,312
1911 (3) 1911 (3)	19,755	21,077	40,831	12,930	5,424	18,354
1921	20,423	22,346	42,769	13,656	5,701	19,357
1931	21,459	23,336	44,795	14,790	6,265	21,055
Italy (*b*):				(4)	(4)	(4)
1871	13,472	13,329	26,801	8,559	4,586	13,144
1881	14,265	14,194	28,460	10,677	7,149	17,825
1901	16,155	16,320	32,475	10,764	5,150	15,914
1911	17,022	17,650	34,671	11,249	5,121	16,371
1921 (former frontiers)	17,918	18,443	36,361	12,605	5,045	17,650
1921 (new frontiers)	18,726	19,248	37,974	13,155	5,277	18,431
1931	20,133	21,044	41,177	13,281	3,882	17,164
1936	20,595	21,850	42,445	13,135	5,279	18,415
Canada (*b*):				(2)	(2)	(2)
1891	2,460	2,373	4,833	1,412	203	1,616
1901	2,752	2,620	5,371	1,560	239	1,799
1911	3,822	3,385	7,207	2,359	365	2,724
1921	4,530	4,258	8,788	2,683	490	3,173
1931	5,375	5,002	10,377	3,261	666	3,927

gainfully occupied in agriculture and forestry in various countries.

occupied population			Population gainfully occupied in agriculture and forestry (1)					
male	female	total	male	female	total	male	female	total
% of total population			in thousands			% of gainfully occupied population		
61.2	24.4	42.4	4,932	2,203	7,135	41.3	44.5	42.3
61.6	25.2	43.0	4,791	2,393	7,184	34.6	40.6	36.4
61.4	30.5	45.7	4,560	3,997	8,557	27.4	47.0	34.0
68.0	35.6	51.3	4,793	4,970	9,763	23.3	43.3	30.5
65.7	34.2	49.5	4,694	4,694	9,343	22.5	40.5	28.9
64.4	36.3	50.0	4,054	4,881	8,934	18.8	38.4	26.1
55.2	24.4	39.8	5,357	1,875	7,232	51.0	40.4	47.8
66.4	33.1	40.6	5,741	2,760	8,501	45.7	43.1	44.8
68.2	34.8	51.3	5,581	2,663	8,244	43.2	30.1	41.8
68.2	39.0	53.3	5,525	3,330	8,855	42.4	43.3	42.7
71.2	42.6	56.2	4,911	3,821	8,732	39.2	46.0	41.9
71.1	42.3	56.0	5,061	3,962	9,023	38.6	46.0	41.5
70.2	37.5	53.2	4,809	3,391	8,200	35.5	43.3	38.3
68.9	37.1	52.4	4,510	3,194	7,704	32.9	40.4	35.6
			(2)	(2)	(2)			
61.3	25.5	42.9	1,535	119	1,654	17.3	3.1	13.0
62.6	26.4	43.9	1,471	81	1,552	14.7	1.8	10.7
64.5	24.9	44.1	1 387	67	1,454	12.0	1.4	8.9
130.9	51.5	89.9	1,489	66	1,555	11.5	1.2	8.5
			1,364	135	1,499	10.5	2.5	8.2
66.9	25.5	45.3	1,261	111	1,372	9.2	1.9	7.1
68.9	26.8	47.0	1,181	76	1,257	8.0	1.2	6.0
			(4)	(4)	(4)			
63.5	34.4	49.0	4,863	2,529	7,392	56.8	55.1	56.2
74.8	50.4	62.6	5,498	3,101	8,599	51.5	43.4	48.2
66.6	31.6	49.0	6,322	3,120	9,443	58.7	60.6	59.3
66.1	29.0	47.2	6,112	2,973	9,086	54.3	58.1	55.5
70.3	27.4	48.5	6,865	2,977	9,841	54.5	50.0	55.8
70.2	27.4	48.5	7,147	3,117	10,264	54.3	50.1	55.7
66.0	18.4	41.7	6,474	1,535	8,009	48.7	39.5	46.7
63.8	24.2	43.4	6,412	2,431	8,843	48.8	46.0	48.0
			(2)	(2)	(2)			
57.4	8.6	33.4	766	12	778	54.2	5.9	48.1
56.7	9.1	33.5	752	9	761	48.2	3.8	42.3
61.7	10.8	37.8	995	16	1,011	42.2	4.4	37.1
59.2	11.5	36.1	1,091	18	1,109	40.7	3.7	35.0
60.7	13.3	37.8	1,199	25	1,224	36.8	3.8	31.2

* Ec. 12 Ingl.

TABLE I (*continued*). — *The evolution of the number of the population*

Country and Census year	Total population: male	Total population: female	Total population: total	Total gainfully: male	Total gainfully: female	Total gainfully: total
	in thousands			in thousands		
United States of America (*a*) (5):				(2)	(2)	(2)
1820	...	...	9,638	...	...	2,881
1830	...	...	12,866	...	...	3,940
1840	...	...	17,069	...	...	5,420
1850	...	...	23,192	...	...	7,697
1860	16,085	15,358	31,443	...	...	10,531
1870	19,494	19,065	38,558	...	...	12,927
1880	25,519	24,637	50,156	...	...	17,390
1890	32,237	30.711	62,948	...	...	23,319
1900	38,816	37,178	75,995	...	...	29,073
1910	47,332	44,640	91,972	...	...	37,454
1920	53,900	51,810	105,711	...	...	41,854
1910	47,332	44,640	91,972	30,092	8,076	38,167
1920	53,900	51,810	105,711	33,065	8,550	41,614
1930	62,137	60,638	122 775	38,078	10,752	48,830
South African Union (Europeans) (*a*):						
1911	685	591	1,276	432	346	778
1921	782	737	1,519	439	74	514
1926	857	820	1,677	491	89	580
Australia: (*a*):						
1901	1,978	1,796	5,774	1,272	344	1,616
1911	2,313	2,142	4,455	1,553	386	1,939
1921	2,763	2,673	5,436	1,840	456	2,296
1933	3,367	3,263	6,630	2,173	629	2,802
New Zealand (not including Maoris) (*a*):						
1906	471	418	889	324	75	399
1911	532	477	1,008	364	90	454
1916	552	548	1,099	355	100	455
1921	623	596	1,219	417	129	546
1926	686	658	1,344	462	130	592
1936	756	735	1,491	545	175	720
Japan (Japan proper) (*b*):						
1872	...	...	34,806	...	...	19,176
1920	28,044	27,919	55,963	16,987	10,274	27,261
1930	32,390	32,060	64,450	19,030	10,589	29,620

(1) The data refer to (*a*) the economic groups or to (*b*) occupational groups: agriculture, forestry, hunting and
of classification, the figures for 1881, 1891 and 1901 must be compared with those in the first column and those
of age in 1871, over 8 years in 1881 and aged 10 years and over in 1901, 1911, 1921, 1931 and 1936. — (5) Figu-
of the American Statistical Association, Vol. XXI, No. 155, Sept., 1926. Figures from 1910-1930 according to U. S.

gainfully occupied in agriculture and forestry in various countries.

occupied population			Population gainfully occupied in agriculture and forestry (1)					
male	female	total	male	female	total	male	female	total
% of total population			in thousands			% of gainfully occupied population		
			(2)	(2)	(2)			
...	...	29.9	...	...	2,082	...	...	72.3
...	...	30.6	...	...	2,788	...	...	70.8
...	...	31.8	...	...	3,739	...	...	69.0
...	...	33.2	...	...	4,990	...	...	64.8
...	...	33.5	...	...	6,340	...	...	60.2
...	...	33.5	...	...	6,961	...	...	53.8
...	...	34.7	...	...	8,595	...	...	49.4
...	...	37.0	...	...	9,942	...	...	42.6
...	...	38.3	...	...	10,889	...	...	37.5
...	...	40.7	...	...	11,946	...	...	31.9
...	...	39.6	...	...	11,193	...	...	26.7
63.6	18.1	41.5	10,823	1,807	12,630	36.0	22.4	33.1
61.3	16.5	39.4	9,852	1,084	10,936	29.8	12.7	26.3
61.3	17.7	39.8	9,812	910	10,722	25.8	8.5	22.0
63.1	58.5	61.0	168	24	192	38.9	6.9	24.7
56.1	10.0	33.8	166	4	170	37.8	5.4	33.1
57.3	10.9	34.6	174	4	178	35.4	4.5	30.7
64.3	10.2	28.0	371	39	410	29.2	11.3	25.4
67.1	18.0	43.5	458	16	474	29.5	4.1	24.4
66.6	17.1	42.2	511	10	522	27.8	2.2	22.7
64.5	19.3	42.3	555	19	574	25.5	3.0	20.5
68.8	17.9	44.9	108	3	111	33.3	4.0	27.8
68.4	18.9	45.0	117	7	124	32.1	7.8	27.3
64.3	18.2	41.4	119	10	129	33.5	10.0	28.4
66.9	21.6	44.8	135	9	144	32.4	7.0	26.4
67.3	19.8	44.0	130	3	134	28.1	2.3	22.6
72.1	23.8	48.3	157	5	164	28.8	3.4	22.8
...	...	55.1	...	...	14,791	...	...	77.1
60.6	36.8	48.7	8,267	6,420	14,687	48.7	62.5	53.9
58.8	33.0	46.0	8,244	6,443	14,687	43.3	60.8	49.6

fishing. — (2) Gainfully occupied population aged 10 years and over. — (3) Owing to the changes in methods for 1921 and 1931 with those in the second column for 1911. — (4) Gainfully occupied population over 15 years res from 1820 to 1920 according to P. K. WHELPTON: Occupational Groups in the United States. In: *Journal* Dept. of Commerce: Fifteenth Census of the United States, 1930. Vol. V, p. 39.

TABLE 2. — *Population gainfully occupied in agriculture, forestry, hunting and fishing in various countries according to the latest census.*

Country (1)	Census year	Number in thousands			as percentage of gainfully occupied population		
		male	female	total	male	female	total
United Kingdom of Great Britain and North Ireland:							
Great Britain (*a*)	1931	1,181	76	1,258	*8.0*	*1.2*	*6.0*
North Ireland (*b*)	1926	135	16	151	*34.7*	*8.8*	*26.5*
Belgium (*b*)	1930	497	141	638	*18.0*	*14.2*	*17.0*
Argentina (*a*) (3)	1940	—	—	1,050	—	—	*18.3*
German Reich (*a*) (2)	1939	4,906	5,941	10,848	*19.7*	*39.8*	*27.3*
The Netherlands (*a*)	1930	546	110	655	*22.6*	*14.3*	*20.6*
Australian Federation (*a*)	1933	569	20	589	*25.3*	*3.1*	*20.3*
United States of America (*a*)	1930	9,837	916	10,753	*25.8*	*8.5*	*22.0*
Switzerland (*a*)	1930	362	51	413	*27.2*	*8.4*	*21.3*
Luxembourg (*a*)	1935	24	17	41	*27.5*	*85.0*	*37.9*
New Zealand (*a*)	1936	157	6	164	*31.0*	*4.6*	*25.3*
France (*a*)	1931	4,510	3,194	7,704	*32.0*	*40.4*	*35.6*
Czechoslovakia (*a*)	1930	1,583	1,097	2,680	*33.9*	*47.4*	*38.3*
South African Union (white population) (*a*)	1926	174	4	178	*35.4*	*4.6*	*30.6*
Canada (*b*)	1931	1,199	25	1,224	*36.8*	*3.7*	*31.2*
Denmark (*b*)	1930	438	121	560	*39.7*	*25.1*	*35.2*
Sweden (*c*)	1930	799	242	1,041	*40.0*	*27.0*	*36.0*
Chile (*a*)	1930	481	25	506	*41.4*	*8.7*	*34.7*
Japan (*b*)	1930	8,244	6,443	412	*43.3*	*60.8*	*49.6*
Norway (*b*)	1930	372	41	8,843	*43.7*	*12.8*	*35.3*
Italy (*a*)	1936	6,412	2,431	1,476	*49.0*	*46.3*	*48.2*
Greece (*b*)	1928	1,008	468	648	*51.1*	*60.5*	*53.7*
Ireland (*b*)	1936	542	107	2,031	*54.8*	*30.4*	*48.4*
Hungary (*b*)	1930	1,560	471	135	*55.0*	*47.4*	*53.0*
Palestine (*b*)	1931	123	12	1,897	*55.2*	*48.5*	*54.5*
Portugal (*b*)	1930	1,122	775	3,525	*58.0*	*43.6*	*51.0*
Egypt (*b*)	1927	3,001	524	9,752	*60.0*	*73.0*	*67.0*
Poland (*b*)	1931	5,429	4,323	4,538	*60.2*	*72.2*	*65.0*
Spain (*b*)	1920	4,217	321	446	*60.8*	*31.1*	*57.0*
Esthonia (*b*)	1934	218	228	802	*60.8*	*74.3*	*67.0*
Latvia (*a*)	1935	387	415	1,108	*61.0*	*73.1*	*67.2*
Finland (*b*)	1930	634	473	27	*62.8*	*67.1*	*64.6*
Iceland (*b*)	1930	21	6	100,037	*63.2*	*40.0*	*56.2*
India (*b*)	1931	72,021	28,016	6,377	*71.0*	*59.1*	*67.2*
Brasil (*b*)	1920	5,769	608	6,377	*71.2*	*41.5*	*66.7*
Romania (*b*)	1930	4,055	4,177	8,231	*71.3*	*87.6*	*78.7*
Bulgaria (*a*)	1934	1,343	1,397	2,740	*72.0*	*92.9*	*81.3*
Mexico (*b*)	1930	3,601	26	3,626	*72.3*	*6.9*	*67.8*
Turkey (*a*)	1935	3,383	3,097	6,480	*72.8*	*94.0*	*81.6*
Jugoslavia (*a*)	1931	3,234	1,862	5,096	*74.5*	*87.1*	*78.7*
Lithuania (not including Memel) (*b*	1923	513	576	1,089	*77.8*	*80.8*	*79.4*
U. R. S. S.	1926	36,170	35,565	71,735	*79.9*	*90,9*	*85.0*

(1) The figures refer to the territory on the day the census was taken and (*a*) to the economic groups or (*b*) occupational groups: agriculture, forestry, hunting and fishing. — (2) Territory as of May 17, 1939 (day the census was taken), not including Memel. — (3) Estimates taken from: A. E. BUNGE: Una nueva Argentina. Buenos Aires, 1940.

family without occupation " is much smaller in agriculture than in the other economic sections. The share of the agricultural population in the total population has therefore always been far from reaching the figure representing the share of the population occupied in agriculture in the total number of gainfully occupied population.

Unfortunately the available data concerning persons depending on the section of agriculture and forestry do not refer to the same German territory as do the figures given in Table 1, as they also include the territory of the Saar. The resulting variations are, however, only of slight importance, because, if the Saar territory is not included, the percentage of the population depending on agriculture and forestry in relation to the total population is increased by no more than 0,1 to 0,2 per cent.

According to the figures given in Table 3, obtained from a preliminary publication concerning the results of the population and occupational census taken on May 17, 1939, the number of persons depending on the section of agriculture and forestry declined considerably after the first occupational census taken in 1882. It is even supposed that the decline had propably already commenced several decades previously. In 1882, this section, with 39.9 per cent. of the total population, still held the first place in numbers among the various sections. But as early as 1895, it was supplanted by the section of industries and crafts and, in 1939, it only represented 18 per cent. of the German population.

TABLE 3. — Germany: *Persons depending on agriculture and forestry 1881 to 1939.*

Year	Total number of inhabitants in thousands	Persons depending on agriculture and forestry		
		in thousands	in percent of the total population	1882 = 100
1882	40,165	16,029	*39.9*	*100.0*
1895	46,360	15,521	*33.5*	*96.8*
1907	55,598	14,996	*27.0*	*93.6*
1925	63,181	14,434	*22.8*	*90.0*
1933	66,029	13,715	*20.8*	*85.6*
1939	(1) 68,128	12,265	*18.0*	*76.5*

(1) Not including persons doing military service and in the labour service.
Source: Wirtschaft und Statistik, 1940, No. 16. Berlin.

During the two last census periods, the rate of decline increased. Special circumstances might however have contributed towards exaggerating the decline which occurred during the period between the last two censuses. This is because, in the first place, the initial figure of the 1933 census should be considered as abnormally high. As a result of the serious unemployment existing during the years of the economic depression, that part of the youth of the agricultural population

who, under normal conditions, would doubtless have abandoned agriculture, had no choice but to remain with their relatives on the farms. In the towns and industrial districts it was extremely difficult to find work and, owing to widespread unemployment, many who had come from the country returned to agriculture. At that time, the shortage of farm labour was seldom complained of; on the contrary, one very often heard of latent unemployment in the rural areas, especially in the regions of small peasant holdings. But persons who thus remained in agriculture did not hesitate to move as soon as economic conditions began to improve.

Moreover, the decline during the period between the last two censuses was partly due to the re-establishment of conscription. Lastly, it should be mentioned that numerous small farmers who in 1933, when they had no other employment, had registered farm work as their principal occupation, entered farm work as a secondary occupation in 1939, after they had again found work in industry or in a craft from which they drew their principal income. Consequently, in 1939, these workers, as well as the members of their families without a principal occupation, were no longer registered as forming part of the agricultural population.

France.

The first investigation concerning the occupational structure of the population was taken in France at the time of the general census of 1851. It is usually supposed, however, that, in the case of this census, the distinction between persons gainfully occupied and the members of their family was not made sufficiently clear. Only by using the occupational statistics obtained from the general population census of 1866 as a basis is it possible, after making certain corrections, to establish a parallel with the data obtained from later censuses.

Table 1 contains the results of interest for our present purpose obtained from the 1866, 1896 and following censuses, with the exception of that taken in 1911. The results of the last-mentioned census are not comparable with those of the others, because of the difference in the methods of registration and tabulation. In 1911, persons gainfully occupied were classified according to their individual occupation in opposition to the methods adopted in the other censuses when they were grouped according to the industry in which they were engaged. Only the figures for 1866, 1921, 1926 and 1931 refer to the same territory.

From 1866 to 1931 the total number of persons gainfully occupied in France rose from 15.1 to 21.6 million; it therefore increased by 6.5 million persons. Since the total population only increased during the same period by 3.2 million persons, the share of gainfully occupied persons in the total population increased from 39.8 per cent. in 1866 to 52.4 per cent. in 1931. This increase is due in part to shifts in the structure of the population according to age and in part also to changes in the methods adopted in taking the census.

The greatest contribution to the increase in the number of persons gainfully occupied was made by the section of « industry and transport » (this increase was from 4.6 to 8.5 million persons); next came trade (from one million to 2.8 per-

sons) and, lastly, public and civil services (from 288,000 to 787,000) and « liberal professions » (from 336,000 to 658,000).

The number of persons gainfully occupied in the section of " agriculture and forestry " amounted in 1931 to 7.7 million persons as against 7.2 million in 1866. But the rate of progress was not always the same, having altered several times during the period under review. The maximum number was reached in 1921 with some 9 million persons. There was a remarkable decline in the course of the decade which followed. In 1931, only 7.7 million persons were gainfully occupied in agriculture and forestry, so that this section had lost about 1.3 million workers during the decade.

The proportion of persons gainfully occupied in agriculture and forestry to the total gainfully occupied population dropped from 47.8 per cent. in 1866 to 35.6 per cent. in 1931. The decline was particularly marked between 1921 and 1931. " Agriculture and forestry " which was still the most important section in 1921, had to yield the first place to " industry and transport " in 1926.

Considering the evolution according to sex, it is found in the first place that in 1896 the number of males gainfully occupied in agriculture and forestry had reached its peak. In 1931, there were only 4.5 million men as against 5.4 million in 1866. Consequently, the fact that the total number of persons gainfully occupied in agriculture and forestry still increased until 1921, was entirely accounted for by the increase in female labour. The proportion of women in the total of persons gainfully occupied in agriculture and forestry rose, in fact, from 25.9 per cent. in 1866 to 43.9 per cent. in 1921, 41.4 per cent. in 1926 and 41.5 per cent. in 1931.

Occupational statistics in France give no indication concerning persons depending on the various economic sections such as were given above for Germany.

Great Britain.

According to the synoptical tables published in the Statistical Abstract for the United Kingdom, the total number of persons gainfully occupied in Great Britain rose from 12.7 million in 1881 to 21.1 million in 1931. The increase took place parallel with the growth of the population, but at the same time there was also a rise in the percentage of gainfully occupied persons. The alterations which occured in the composition of the age groups contributed to a certain extent to this change.

The total increase of persons gainfully occupied was distributed throughout the non-agricultural branches of economic activity in the country. It is generally admitted that the number of persons gainfully occupied in agriculture and forestry was already beginning to decline about the middle of the last century. But only from 1881 can the development be followed and expressed in figures. The figures of the various censuses are, however, only approximately comparable, because the methods of registration and classification have been changed several times.

At the time of the 1881 census, 1,654,000 persons, or 13 per cent. of the total gainfully occupied population, were counted as being gainfully occupied in

agriculture and forestry. The seventies had been still relatively favourable to agriculture in Great Britain. During the early eighties the economic conditions on which agriculture depended showed a steady deterioration. On the one hand, overseas competition increased, especially from the two Americas and Australia, while, on the other hand, the rapid development of industrial and commercial activity deprived agriculture of labour to an ever increasing extent. Agriculture suffered, moreover, from emigration to foreign coutries and was compelled to seek to counteract these two disadvantages by turning from arable farming to stock-breeding and by a more extensive use of machinery.

Meanwhile, the trend of development was not steady but followed the ups and downs of the economic situation. The number of persons gainfully occupied in agriculture and forestry fell in 1901 as low as 1,454,000. During the next decade there was again a slight increase. Agriculture had been steadily adapting its production and methods of farming to the country's economic policy and had to a great extent adopted farming systems requiring but little labour. The heavy loss of workers, added to the improved situation on the world market of those products which had become of prime importance to British agriculture, ended by improving living conditions for those who remained, and the conditions of agricultural production were to a certain extent stabilised. For evident reasons, the number of persons gainfully occupied in agriculture and forestry continued to increase during the war of 1914-18, but afterwards, although the level attained was already very low, a further severe decline took place, *i. e.*, from 1,372,000 in 1921 to 1,257,000 in 1931. The percentage of persons gainfully occupied in agriculture and forestry in relation to the total population gainfully occupied fell thus to 6 per cent.

While, as has been seen, in Germany and France a considerable part of the agricultural work is done by women, in Great Britain on the contrary, the number of women registered in the census as gainfully occupied in agriculture and forestry is much lower.

A good idea of the numerical evolution of the population gainfully occupied in agriculture since 1921 is given by the statistics compiled by the Ministry of Agriculture and Fisheries for England and Wales and by the Department of Agriculture for Scotland concerning the number of workers (persons gainfully occupied not including employers, their wives and domestic servants) employed on agricultural holdings with an area of more than one acre. A summary of the figures from 1921 to 1938 is given in Table 4.

As will be seen from this table, the number of fixed workers with the exception of the fluctuations which occurred in the years between 1923 and 1925, shows a steady decline, falling from 789,000 to 601,000. The most severe decline—a fact of especial importance for the future—was registered in the number of regular male workers under 21 years of age, this number having fallen from 179,000 in 1921 to 108,000 in 1938. Relatively even more severe was the decline in casual male workers under 21 years, the number falling from 31,000, in round figures, in 1921 to 8,400 in 1938. The total number of casual workers fell from about 207,000 in 1921 to 93,900 in 1938.

TABLE 4. — **Great Britain**: *Number of workers employed on agricultural holdings of more than* 1 *acre* (1).

(in thousands)

Year	Regular workers				Casual workers			
	Males			Females	Males			Females
	under 21 years	21 years and over	total		under 21 years	21 years and over	total	
1921	179	516	694	95	31	112	143	64
1923	162	484	646	80	28	85	114	53
1924	163	500	662	82	29	94	124	55
1925	160	502	662	80	27	98	125	59
1926	158	517	675	83	24	88	112	52
1927	157	513	669	82	21	73	94	48
1928	151	514	665	86	15	82	96	43
1929	147	512	659	86	15	86	100	43
1930	139	506	645	84	13	76	89	39
1931	137	494	631	82	12	68	80	30
1932	136	479	614	80	12	70	82	32
1933	133	482	614	77	15	86	100	36
1934	127	475	601	72	12	79	91	37
1935	124	473	598	68	12	75	87	34
1936	121	461	582	61	11	64	75	33
1937	114	455	568	62	10	65	75	36
1938 (2)	108	438	545	56	8	54	63	31

(1) Excluding the occupier, his wife, and domestic servants.
(2) Preliminary figures.
Source: Agricultural Statistics 1937, Vol. LXXII, Part. I, p. 48.

The decline in the total number of agricultural workers continued after 1931, in spite of numerous measures of assistance, as well as of protective tariffs and other restrictions on imports adopted in favour of agriculture. The decrease was not even compensated by an increase in the number of independent persons and their wives. Indeed, the number of farms with an area exceeding one acre did not increase, but, on the contrary, declined; in 1937 the number was only 444,024 as against 496,136 in 1921.

Italy.

In Italy occupational statistics have been collected in connection with the general censuses of the population taken in 1871, 1881, 1901, 1911, 1921, 1931 and 1936. Figures are given in Table 1 for each census concerning the population present, the total number of persons gainfully occupied and the number of persons gainfully occupied in agriculture and forestry. The data concerning female persons gainfully occupied and the total number of gainfully occupied persons for all occupations as well as for agriculture and forestry, have only been given in the table for the sake of completeness. The extent of the fluctuations shown by these data from one census to the other, especially the decline in the

number of female persons gainfully occupied in agriculture and forestry from 3.1 million in 1921 to 1.5 million in 1931 and the subsequent recovery under the same heading to 2.4 million in 1936, lead to the supposition that considerable changes have occurred in the census methods and that consequently these figures have no value for a study of the evolution in this field.

The comparability of the figures concerning gainfully occupied male persons in Italy as in other countries is limited as well. Above all, it loses much of its value because the methods of counting and classification have been altered from one census to another. On the other hand, changes took place in the frontiers of the country and, moreover, the figures for 1871 refer only to persons over 15 years of age, those for 1881 to persons over 8 while those for the subsequent censuses consider gainfully occupied persons aged 10 years and over. It may nevertheless be assumed that, in spite of all this, the figures may be taken at least as showing clearly the trend of the evolution (1).

It may be assumed that in Italy, during the last decades of the XIX century, the increase in the number of persons gainfully occupied in agriculture and forestry progressed at the same rate as did the general increase of the total gainfully occupied population. Agriculture and forestry constituted the most important economic section in the country and in 1901 still employed approximately 50 per cent. of the gainfully occupied population aged 10 years and over.

But in the following decade (1901-11), the increase in the population engaged in agriculture and forestry registered a halt. The number of births in this section of the population was great, both before and after, but the losses resulting from migration being still greater, there was—to judge from the data concerning the number of gainfully occupied male persons—an absolute diminution in the numbers of agricultural population. Migration was directed mostly to foreign countries. Owing to the slow rate of progress of industrialization, the possibility of employment in non-agricultural occupations within the country were far from sufficient to absorb the increase in population. Italian emigration, which has always been largely recruited from the ranks of the agricultural population, increased from some 300,000 persons on an average for the period 1895 to 1899, and from 352,782 in 1900 to 726,331 in 1905, 787,977 in 1906 and 704,675 in 1907. Numerous emigrants, however, were not completely lost to Italian agriculture, because years after they returned with their savings to purchase small holdings (2).

(1) The figures given for Italy in Table 1 have been kindly supplied by Prof. A. MOLINARI, Director general of the Central Institute of Statistics in Italy. A study concerning the value and comparability of figures as well as the changes which have occurred in the structure of the agricultural population in Italy will be found in A. MOLINARI: La struttura della popolazione italiana e le nuove figure agricole rilevate nell'VIII censimento. Roma, Istituto Centrale di Statistica del Regno d'Italia, 1937.

(2) See in this connection the final report by Prof. LORENZONI concerning the inquiry into the new formation of small agricultural holdings in the post-war period in Italy as carried out by the ITALIAN NATIONAL INSTITUTE FOR AGRICULTURAL ECONOMICS (Istituto Nazionale di Economia Agraria: Inchiesta sulla piccola proprietà coltivatrice formatasi nel dopoguerra. XV, Relazione finale. Rome, 1938).

Even after the 1911 census, the same factors were at work, and it was only the war of 1915-18 that brought a change. As a result of war conditions, the situation of agriculture became more profitable and the need to abandon agriculture less pressing; moreover, the possibilities of emigration abroad were gradually reduced and since the country's economy could not offer other opportunities in exchange, the flight from the land was extremely limited. The number of emigrants to other countries declined indeed from 872,598 in 1913 to 28,311 in 1918 The agricultural population was compelled to keep a larger number of its natural increase. The number of male persons gainfully occupied in agriculture and forestry in the former territory of the Kingdom increased, in fact, from 6.1 million in 1911 to 6.9 million in 1921.

This increase was of but short duration, however. The economic progress made in Italy itself soon after 1921 and the renewed opportunities for emigration which were, it is true, less frequent than previously, soon deprived agriculture of the accumulated population and, moreover, of the surplus births as well as of a part of the original numbers. In 1931 there were only 6.5 million male persons gainfully occupied in agriculture and forestry as against 7.1 million in 1921. This decline might, nevertheless, partly be due to the fact that, as the result of the more severe application of the law concerning compulsory education, the number of gainfully occupied young people between the ages of 10 and 14 years dropped steadily.

The general economic depression which occurred at the end of the twenties once more reduced the possibilities of migration for the surplus agricultural population. Emigration was very limited and the economy of the country itself offered but slight hope of employment. In industry and the arts and crafts the number of unemployed increased, and the number of emigrants fell from 280,097 in 1930 to 165,860 in 1931 and dropped still further to 41,710 in 1936. Consequently, in 1936 the number of males occupied in agriculture and forestry was but little lower than in 1931. Their share in the total of persons gainfully occupied remained as before, always high; according to the results of the 1936 census it was still 48.8 per cent. as against 58.7 in 1901.

Canada.

The censuses taken in Canada every ten years since 1891 supply approximately comparable figures concerning the occupational structure of the population. During the 40 years which elapsed between 1891 and 1931, the number of the total population in Canada increased from 4.8 million to 10.4 million and the population gainfully occupied from 1.6 million to 3.9 million. The increase in the number of persons gainfully occupied in agriculture and forestry was only 450,000, or one fifth of the total increase in gainfully occupied persons; their share in the total gainfully occupied population declined, consequently, from 48.1 per cent. in 1891 to 31.2 per cent. in 1931. As the number of women gainfully occupied in agriculture and forestry was small, the proportion of male persons engaged in occupations connected with agriculture and forestry to the total of per-

sons gainfully occupied was slightly greater, reaching 54.2 per cent. in 1891 and 36.8 per cent. in 1931.

Between 1891 and 1901 the absolute number of persons engaged in occupations connected with agriculture and forestry dropped slightly; afterwards it progressed steadily from one census to another and in 1931 amounted to 1,224,000 as against 778,000 in 1891. The increase is, however, of slight dimensions when compared with the espansion which took place during the same period in agricultural production (see Table 5).

TABLE 5. — Canada: *Development of agricultural production between 1891 and 1931.*

Branches of production	1891	1901	1911	1921	1931
Field products: *total area cultivated in thousands of acres*	15,663	19,764	30,556	47,553	58,862
Wheat: *in thousands of acres*	2,701	4,225	8,865	17,836	26,355
Cattle: *total in thousands head*	4,121	5,576	6,526	8,519	7,973
milch cows *in thousands head*	1,857	2,409	2,595	3,325	3,372
Sheep: *total in thousands head*	2,564	2,510	2,174	3,204	3,627
Pigs: *total in thousands head*	1,734	2,354	3,635	3,405	4,670
Poultry: *total in thousands head*	14,105	17,923	31,793	50,325	65,468
Milk production: *in million lbs*	...	6,867	9,807	10,976	15,773

United States of America.

The first inquiry concerning the occupational structure of the gainfully occupied population in the United States was made in 1820. But this inquiry, as well as the next two, made in 1830 and 1840, presented many shortcomings. The first attempt at a comprehensive occupational census was made in 1850, but this census also missed some groups of the gainfully occupied population. Its result cannot, therefore, be compared with those of the subsequent censuses unless some more or less important corrections are made. In spite of the numerous difficulties encountered in making this comparison, several authors have attempted to achieve comparability, at least in so far as the large economic groups are concerned, by revising or reconciling the data of the various censuses. Table 1 shows the figures compiled by P. K. Whelpton for the censuses from 1820 to 1920 and the Census figures from 1910 to 1930.

According to this table the number of persons gainfully occupied aged 10 years and over rose from 2.9 million in 1820 to 41.9 in 1920. The share of gainfully occupied persons in the population of ten years and over has changed but slightly in 100 years; it was 44.7 per cent. in 1820, 44.3 per cent. in 1870, 50.6 per cent. in 1920 and 49.5 per cent. in 1930. But the increase in the percentage of gainfully occupied men was much lower than the former average, rising to

74.8 per cent. in 1870 and to 76.2 per cent. in 1930. The percentage for women had, on the contrary, increased from 13.1 per cent. in 1870 to 22.0 per cent. in 1930.

The section of activity registering the greatest increase in numbers of gainfully occupied persons was industry, where the number of persons gainfully occupied increased from 2.7 million in 1870 to 7.9 million in 1900, 12.8 million in 1920 and 14.1 million in 1930. In relative figures, the increase was particularly great in transport and communications, trade, public utilities and the liberal professions.

Of all persons gainfully occupied in 1820, some 2.1 million (72.3 per cent.) belonged to agriculture and forestry section. All the other economic sections taken together, even during the following decades, remained far behind it in numbers. The relative importance of agriculture and forestry, however, diminished steadily. The absolute number of persons gainfully occupied in agriculture and forestry, which reached its peak at the time of the 1910 census (11.9 or 12.6 million) was overtaken for the first time in 1920 by the number of persons gainfully occupied in industry. The proportion of workers in agriculture and forestry to the total number of persons gainfully occupied dropped from 53.8 per cent. in 1870 to 37.5 per cent. in 1900, 31.9 per cent. in 1910, 26.3 per cent. (or 26.7) in 1920 and 22.0 per cent. in 1930.

The decline registered in the number of persons gainfully occupied in agriculture and forestry after 1910 was due to a great extent to the decrease in the number of gainfully occupied young people. As a result of the stricter observance of the legal age-limits concerning child labour and the regulations in connection with school attendance, as well as owing to changes in the methods of taking the census, the number of gainfully occupied young people declined in all occupations. From 1880 to 1910 there has still been an increase from 16.8 per cent. to 18.4 per cent. in the percentage of children between the ages of 10 and 15 registered in the census as gainfully occupied, but afterwards it declined to 8.5 per cent. in 1920 and to 4.7 per cent. in 1930.

This development had been marked, above all, in connection with the number of persons gainfully occupied in agriculture, because the majority of young workers (1910: 70 odd per cent.) was always registered in the agricultural section. In 1910, the proportion of persons fom 10 to 15 years to the total number of persons gainfully occupied in agriculture was 9.6 per cent. for men and as much as 22.7 per cent. for women. It is true that in 1930 the corresponding figures had fallen to 3.6 and 13.9 per cent. respectively, but they were always higher than the corresponding figures for any other branch of production.

The importance of female labour varies greatly from one State to another. Taking an average for all the States, women represented, in 1930, 8.7 per cent. of persons gainfully occupied in agriculture and forestry; in the north Central States this figure amounted only to 2.6 per cent. The decline in female labour observed from a comparison of figures for 1910 and 1930, is explained partly, besides the decline in child labour, by the fact that the former of these two censuses was taken on April 15 and the latter on January 1, *i.e.*, during a period when employment is slack.

Since the 1920 census, the total population of the United States has also been divided into farm population and nonfarm population All persons present on farms, whether occupied in agriculture or not, are considered as farm population. According to the 1930 census a farm for census purposes is all land which is directly farmed by one person, either by his own labour alone or with the assistance of members of his household or hired workers. The enumerators were instructed not to report as a farm any tract of land less than 3 acres, unless its agricultural products in 1929 were valued at $250 or more.

TABLE 6. — United States: *Total population, nonfarm population and farm popultion.*

Year (January 1)	Total population in thousands	Nonfarm population in thousands	Farm population in thousands	Farm population in percent of the total population
1850	23,192	11,512	11,680	*50.4*
1860	31,443	16,302	15,141	*48.2*
1870	39,818	21,445	18.373	*46.1*
1880	50,156	27,175	22,981	*45.8*
1890	62,948	36,569	26,379	*41.9*
1900	75,995	46,581	29,414	*38.7*
1910	91,417	59,340	32,077	*35.1*
1915	99,884	67,440	32,440	*32.5*
1920	105,861	74,247	31,614	*29.9*
1925	115,160	84,330	30,830	*26.8*
1930	122,497	92,328	30,169	*24.6*
1935	127,864	95,063	31,801	*24.9*
1936	127,718	96,363	31,355	*24.6*
1937	128,474	97,628	30,846	*24.0*
1938	129,353	98,851	30,502	*23.6*
1939	130,404	100,099	30,305	*23.2*
1940	•131,456	101,377	30,079	*22.9*

Sources:

1850-1900: SUPPLEMENTARY REPORT OF THE LAND PLANNING COMMITTEE TO THE NATIONAL RESOURCES BOARD. Part 1, General conditions and tendencies influencing the Nation's Land Requirements. Washington, 1936.

1910-1940: BUREAU OF AGRICULTURAL ECONOMICS, U. S. Dept. of Agriculture: The Farm Income Situation, August 1941. Washington, 1941.

Table 6 shows the movement of the farm population as from 1850. The data for 1920 and 1935 are census figures. For 1930, the figures of the census taken on April 1, have been reduced by roughly 1 per cent. in order to eliminate the seasonal difference between the farm population on January 1 and on April 1. As regards the figures for the other years, these are estimates based on the variations in the number of farms and the average size of the rural family (1910) or on the variations in the number of male persons gainfully occupied in agriculture over the age of 16 years (from 1850 to 1900).

The farm population was therefore estimated for 1850 at 11.7 million persons, representing 50.4 per cent. of the total population. The enormous increase in the agricultural population registered during the following decades, which was made possible by the extensive immigration of European peasants, led to an extremely rapid increase in the farm population to 29.4 million in 1900 and 32.4 million in 1915. The maximum was probably reached in 1916 when 32.5 million persons were registered. In 1917 and 1918, as a result of conscription, and of the passage from agriculture to better-paid occupations, there was a decrease. The return of demobilized soldiers led to a temporary increase during the next two years, succeeded by a steady decline in the following years. From 1927 to 1930 it fluctuated around 30.2 million. During the depression which followed, the trend again changed: migration from the farms decreased while the number of persons who returned to the farms increased and in 1932 it exceeded by 266,000 units the number of those who left the farms. In 1935 the farm population again increased to 31.8 million. But this figure marked another peak. The recovery of economic activities led once more to an intensified migration to the towns and the numbers of the farm population again gradually declined until it reached 30.1 million in 1940.

Table 7 shows to what extent, during the three last decades, the variations in the numbers of farm population differ from those in the numbers of nonfarm population. The last time the number of persons living on farms reached a peak, namely, in 1935, it was almost as high as in 1910; in 1940, on the contrary, it was 6.2 per cent. below the 1910 figure. The number of nonfarm population, on the other hand, increased steadily and in 1940 exceeded the 1910 figure by 70.8 per cent.

TABLE 7. — United States: *Index numbers of nonfarm population, farm population and farms.*

(1910 = 100).

Year (January, 1)	Nonfarm population	Farm population	Number of farms
1910	100	100	100
1915	114	101	103
1920	125	99	101
1925	142	96	100
1930	156	94	99
1935	160	99	107
1936	162	98	104
1937	165	96	102
1938	167	95	99
1939	169	95	98
1940	171	94	96

Source (for the absolute figures) : BUREAU OF AGRICULTURAL ECONOMICS, U. S. Dept. of Agriculture: The Farm Income Situation, August 1941. Washington, 1941.

Parallel with the fluctuations in the numbers of the farm population were the variations in the number of farms. Compared with the basic figure for 1910 the index numbers of the farm population were, until 1935, to an ever increasing extent, lower than the index numbers of farms. The cause of this must be sought in the constant diminution of the average number of persons per farm. This average fell from. 5.04 persons in 1910 to 4.80 persons in 1930. After 1935 the number of farms declined to a greater extent than did that of farm population, so that in 1940 the population per farm again numbered 4.93 persons.

Argentina.

No Census figures are available concerning the movement in the numbers of persons gainfully occupied in agriculture and forestry in Argentina during the last decades, because no census has been taken since 1914. Estimates make it possible, however, to obtain an idea of the changes which have taken place.

According to the data supplied by A. E. BUNGE (see Table 8), the number of persons gainfully occupied in Argentina increased from 3.2 million in 1914 to 5.0 million in 1933 and to 5.7 million in 1940. Agriculture played only a small part in this increase (*i. e*, 6.8 per cent.), and the number of persons gainfully occupied in agriculture amounted to only 1,050,000 million in 1940 as compared with 880,000 in 1914. The proportion of these persons to the total gainfully occupied population which had already dropped to only 27.2 per cent. in 1914, fell to 22.7 per cent. in 1933 and 18.3 per cent. in 1940. Consequently, in spite of the great importance of agriculture in Argentinian economy, the proportion of the population living directly on agriculture is low. The absolute increase in agricultural population after 1914 was also low, when compared with the development of agricultural production.

TABLE 8. — Argentina: *Gainfully occupied population according to the 1914 census figures and to estimates for 1933 and 1940.*

Occupational groups	in thousands	in percent	in thousands	in percent	in thousands	in percent
Industry	1,246	*38.6*	2,156	*43.0*	2,770	*48.3*
Agriculture and stock-breeding	880	*27.2*	1,137	*22.7*	1,050	*18.3*
Trade	349	*10.7*	603	*12.0*	750	*13.1*
Transport services	111	*3.4*	151	*3.0*	160	*2.8*
Other occupations	647	*20.1*	971	*19.3*	1,000	*17.5*
Total gainfully occupied population	3,233	*100.0*	5,018	*100.0*	5,730	*100.0*

Source: BUNGE, A. E.: Una nueva Argentina. Buenos Aires, 1940, p. 165.

Australia and New Zealand.

Both in Australia and in New Zealand the number of persons gainfully occupied in agriculture and forestry has increased steadily during the past decades. This increase is, however, of slight importance, whether expressed in absolute figures or in relation to the increase in the total population and in gainfully occupied population. Thus the proportion to the total gainfully occupied population of persons gainfully occupied in agriculture and forestry declined from one census to the other; according to the latest censuses, it amounted only to 20.5 per cent. in Australia and 22.8 per cent. in New Zealand. The total of persons gainfully occupied in agriculture and forestry in the countries is very low considering their importance on the world market of agricultural products. In fact, their number amounted in Australia to only 574,000 in 1933 and in New Zealand to 164,000 in 1936.

Japan.

Up to the present, for Japan proper, we possess the results of two occupational censuses taken in 1920 and 1930. As regards the occupational structure of the population gainfully occupied during the previous decades, information is to be found since 1872 in the Tables of the Census Register of the Home Department. It is true that these figures have only an approximate value, but they enable us to follow the course of the evolution.

The population of Japan proper increased, between 1872 and 1930, from 34.8 million to 64.5 million and the gainfully occupied from 19.2 to 29.6 million persons. The proportion, in respect of the total gainfully occupied population dropped, consequently, from 55.1 per cent. to 46.0 per cent.

The increase in the number of gainfully occupied persons was registered only in non-agricultural occupations, the number of persons gainfully occupied in agriculture and forestry having changed but little between 1872 and 1930. It dropped from 14,790,999 (not including fishing: 14,787,441) in 1872 to 14,686,674 (14,128,360) in 1920 and to 14,686,731 (14,140,107) in 1930.

The proportion, in relation to the total number of gainfully occupied persons, of persons gainfully occupied in agriculture and forestry dropped from 77.1 per cent. in 1872 to 53.9 per cent in 1920 and to 49.6 per cent. in 1930. In spite of extensive industrialization and urbanization, this proportion is still very high in Japan in comparison with the western nations. With 47.7 per cent. of all persons gainfully occupied, agriculture and forestry (not including fishing), represent, now as before, the most important of all the occupational sections of the country. Next come industry (19.3 per cent.), trade, which has made the greatest strides during the last few decades (15.1 per cent.), the section of employees and liberal professions, whose numbers also show a strong and constant increase (6.9 per cent.), transport (3.7 per cent.), domestic service (2.6 per cent.), mining (0.9 per cent.) and the other branches of occupation (1.9 per cent.).

Absolute or relative decline of the population gainfully occupied in agriculture as a result of the flight from agricultural occupations.

It seems to us that the above review shows fairly clearly what has been the evolution of the agricultural population in those countries which exercise a decisive influence upon world trade. As may be seen from the figures at our disposal, the agricultural population in Great Britain had already reached its highest point by the middle of last century. In the other European countries, the numbers of agricultural population continued to increase, but in relation to the total population it declined from one decade to another. During the last decades of the century, in countries like France, Germany, Belgium, the Netherlands, Switzerland and Sweden, the absolute number of the agricultural population also commenced to decline. Considered as a whole, the numbers of the agricultural population of Europe (exclusive of Russia) would scarcely seem to have undergone any essential changes during the 50 years previous to 1914. In the new countries of the world economy, on the other hand, the agricultural population continued to increase, owing not only to a large surplus of births, but chiefly because of the influx of immigrants from the agricultural population of Europe.

A radical change took place as a result of the evolution of world agricultural economy caused by the war of 1914-18. The absolute decline of the agricultural population spread to nearly every progressive country. Where any increase still existed, it was but very slight in proportion to the existing agricultural population and, above all, in relation to the total agricultural population of the countries closely bound together by the international market in agricultural products.

Considered from the purely external standpoint, the decrease in agricultural population was the result of the migration from agriculture to other occupations and only in exceptional cases did it depend upon a low birth-rate. Even today, nearly everywhere, the birth-rate is much higher in the country, and especially among the agricultural population, than it is in the towns, and particularly in the large cities. Statistics provide one single exception to the rule: this exception is France, where the decline in the birth rate made its appearance several decades earlier than in the other European countries. In this connection, France has always occupied a place apart. In the south-west and the centre of the country there are several purely rural departments where, during the past decades, the birth-rate has been lower than in the towns and where it was lower than the death-rate. In this case the low natality led to a considerable decline in the population gainfully occupied in agriculture, the more so because the losses due to the flight from the land were often also very great. But in these cases, too, the flight from the land was the primary general cause of the decline in the number of persons gainfully occupied in agriculture. The rural exodus, which began several decades ago, has constantly caused wide gaps in the reproductive age groups, so that the share in the total agricultural population of older persons has been disproportionately increased.

As may be seen from the figures quoted above, migration from agriculture in the various countries was neither constant nor equally intense. It rather followed the fluctuations of the economic situation; in periods of stagnation it declin-

ed, only to transform itself, in times of recovery, into an impetuous torrent which often, in a very brief space, carried away the human reserves which had accumulated in agriculture.

But how did it happen that millions of men turned their backs on agriculture, and how could agriculture dispense with them without, as a result, imperiling supplies of foodstuffs and agricultural raw materials of which, indeed, there has been an even greater abundance than before ? These are the questions which will engage our attention now.

II. — Why do people abandon agriculture?

The individual causes.

The numerous local investigations undertaken in the most widely differing countries show the great diversity of causes which, in each individual case, led to the decision to leave agriculture. The decision was but rarely due to a single reason; in most cases, it was due to a combination of various circumstances. Which of these was decisive, it is difficult to say. All the individual reasons can, however, be reduced to a common denominator: the desire to improve living and working conditions.

Most of the local investigations still adhere to the old practice of dividing the causes of the migration from agriculture to other occupations into two sets: economic and non-economic. Among the economic causes the following are always quoted: inadequate remuneration and long working hours: lack of regular leisure hours; excessively heavy or dirty work; overworking of women; lack of opportunity for improving the social status; lack of opportunities for permanent employment; impossibility of founding a family or of creating an adequate basis of livelihood; lack of educational facilities for children; bad housing conditions; lack of social welfare work as provided for other occupations and the economic or contractual reasons compelling the wives of farm labourers to take part in field work.

The non-economic causes most often brought forward are: dislike of farm work; monotony of country life; social dependence; bad treatment by the employers and desire for greater independence during free time.

The above enumeration, which does not take the individual importance of each item into account, is sufficient to show how impossible it is to make a clear distinction between the two sets of causes, since they often overlap and influence each other reciprocally. This is one of the reasons why, taken as a whole, decisive importance is attributed sometimes to one and sometimes to the other set. It may even be that one person considers as economic what another regards as non-economic. The difference of opinion may also be due to the fact that the point of view adopted concerning the problem as a whole is often based on preconceived notions as regards certain social, political and demographic matters. Approching the problem impartially, it must, however, be observed that, in the majority of cases, the importance of the economic causes is vastly

greater than that of the non-economic causes and that the cases in which the latter may be considered as having alone been operative, are extremely rare. This has been repeatedly demonstrated in recent investigations of the subject with much clearness (1).

Earlier explanations of the abandonment of agriculture as a world-wide phenomenon.

The list of the various causes which have led to migration from agriculture may suffice to describe the state of affairs in a given region, but it in no way explains the universal extension of this phenomenon. This is why in various theoretical studies several attempts have been made to reduce the numerous single causes to one primary cause. The considerations in question have for a long time been based on the three following facts:

(1) the distribution of landed property,
(2) the law of diminishing returns,
(3) the low profitableness of agriculture.

The various points of view expounded in these studies can only be discussed here briefly. A careful critical exposition of these various views may be found in the comprehensive study published by P. Quante (2) on the extent and causes of the flight from agriculture.

The distribution of landed property. — In less recent works devoted to the problem and, in the first place, in those dealing with conditions in European

(1) Among numerous recent publications mention may be made of:

XVIIIth INTERNATIONAL CONGRESS OF AGRICULTURE, DRESDEN, 1939: Section I (Agrarian Policy and Farm Management), Topic 2: The New Flight from the Land, its Causes and the Means of Combating it (Main Report by Mr. AUGÉ-LARIBÉ; Special Reports by E. HATESAUL for Germany, by St. ČAČKO for Slovakia, by J. KNESPL and A. PROKES for Bohemia and Moravia, by Mr. GIELE and Mr. MARIQUE for Belgium, by A. LEHTINEN for Finland, by M. FOUCHET and G. VÉE for France, by D. v. BOTH for Hungary, by A. AIMI for Italy, by O. BJONER for Norway, by A. BASSARABEANU and M. LAZARU for Romania).

DIE LÄNDLICHE ARBEITSVERFASSUNG IM WESTEN UND SÜDEN DES REICHES. Beiträge zur Landfluchtfrage. Herausgegeben und bearbeitet von Prof. Dr. KONRAD MEYER und Dr. KLAUS THIEDE unter Mitwirkung von Dr. UDO FROESER. Berlin, 1941.

ISTITUTO NAZIONALE DI ECONOMIA AGRARIA: Lo spopolamento montano in Italia. I-VIII. Rome, 1932-1938.

SCHWEIZERISCHES BAUERNSEKRETARIAT: Massnahmen zur Milderung des Mangels an Arbeitskräften in der Landwirtschaft. Brugg, 1940.

BRIZI, A. : Aspetti e redditi del lavoro agricolo. Florence, 1942.

HERBERT, W. H. : Die ökonomischen Ursachen der Landflucht in der modernen Volkswirtschaft. In: *Internationale Agrarrundschau*, June, 1941, Berlin.

SERPIERI, A. : L'agricoltura nell'economia della nazione. Firenze, 1940.

See also publications mentioned on page 395.

(2) QUANTE, P.: Die Flucht aus der Landwirtschaft. Berlin, 1933.

countries, the principal and sometimes the only cause of the migration from agriculture to other occupations, is ascribed to the distribution of landed property, or, to be exact, to the two extreme cases, namely, the preponderance of large farms and the excessive parcelling of real estate. Some authors even went so far as to establish a certain definite interdependence between rural exodus and the extension of large landed property, considering that such migratory movement increases on parallel lines with the increase in large estates. This erroneous conception could only be the consequence of the fact that at that time the migratory movement towards the towns was, in the first place, not to say exclusively, looked upon as concerning farm labour, while the large estate was repudiated for social, economic, demographic or purely political considerations. Had the question been carefully studied, it would perforce have been observed that the passage from agriculture to non-agricultural occupations was not at all confined to regions where the large estates predominate, but was also to be found in peasant districts; it could have been observed, too, that in these districts, given the greater density of the population, the number of persons who turned their backs on agriculture was often higher in absolute figures and, when compared with the figures of the agricultural population, in relative figures as well.

This observation gives, moreover, its true value to the importance attributed generally and by most people to the other extreme, namely, to the excessive parcelling of landed property.

As regards Germany, where the available statistics make it possible to obtain a particularly good view of the extent and direction of the migratory movement, P. Quante, in the work already quoted, adduces irrefutable statistical evidence of the fact that the rural population lost its surplus births everywhere, in those regions, therefore, where the large estate predominates as well as in those where the medium-size and small peasant holdings predominate, proving also that the phenomenon of migration extended to all social classes.

Thus, the distribution of landed property cannot be considered as the primary cause of the flight from the land. Its importance as a factor affecting the extent of the migratory movement in certain regions should, however, in no way be minimized, although it always remains but a secondary cause of this movement. In judging of rural exodus as a regional phenomenon, the distribution of landed property must be considered as an essential factor.

If this were not the case, how could we explain the fact that in regions where large estates predominate, migration is usually and unhesitatingly described as rural exodus and is regarded as both prejudicial and undesirable, while the migration from areas densely populated by small peasants is welcomed as a desirable phenomenon. The explanation is simply that what matters is not merely the absolute or relative number of persons leaving, but also the number and quality of those who remain. In this respect, then, it often happens, that the low density of the population in districts where large estates predominate has but little to do with the natural and economic conditions of production, but is exclusively or mainly a consequence of the agrarian structure which drives away workers, and often, indeed, the very best of them.

The law of diminishing returns. — Other authors sought the ultimate reason for the rural exodus in the law of diminishing returns. The well-known fundamental idea of this law is that by increasing the outlay of labour and capital, it is possible to increase the yield of the land, but that such an increase in the outlay of labour and capital, allowing that the other conditions of production remain unaltered, sooner or later reaches a point after which the increase in the yield is no longer in proportion to the increase in the outlay of capital and labour, but shrinks steadily and in the end ceases altogether.

As matters are quite different in industrial production, where it is possible not only for the increase in return to keep pace with the increase in energy input, but also for the former to overtake the latter, it is concluded that the productivity of agriculture and that of industry do not run parallel, and that this divergence is the occasion of the migration from the land. This deduction, however, is doubtless false. If it were conclusive, migration ought to cease when the increase in the productivity of agriculture and of industry becomes the same. That this is not the case will be shown later.

The low profitableness of agriculture. — Among those who were the first clearly to give prominence to the economic causes of migration is HAINISCH [1]. This writer, as did many others after him, recognized that the principal cause of the passage from agriculture to other occupations was the low remuneration of agricultural labour. This observation does not, however, go down to the root of the matter. One may justifiably ask: what then is the reason of the remuneration of labour in agriculture being so low?

But the reference to the low profitableness of agriculture advances us only very little. Even, the explanation proferred by HAINISCH and others, *i. e.*, that the weakness of agriculture lies in the difficulty it encounters in adapting itself to the capitalistic system, misses the core of the problem. Indeed, if this idea were to be followed through, it would have to be admitted that, given a better adjustment of agriculture to the capitalistic system, migration should cease. In reality, exactly the opposite would occur.

The uneven development of the productivity of labour in agriculture and of the demand for agricultural products as the general cause of the abandonment of agriculture.

The decline in the agricultural population, remarkable in all progressive countries, cannot be adequately explained unless considered as a phenomenon inherent to the general process of economic evolution.

Whatever may be, in each case, the motive forces of economic progress, they always serve to attain the same ultimate end, namely, to obtain the highest

(1) HAINISCH, Michael: Die Landflucht, ihr Wesen und ihre Bekämpfung im Rahmen einer Agrarreform. Jena, 1924.

returns with the minimum use of labour or, in other words, to guarantee the satisfaction of requirements by employing a decreasing amount of labour. The result of these efforts is particularly important when dealing with commodities of prime necessity and, above all, with agricultural products.

Only in so far as success is achieved in reducing the amount of labour necessary for obtaining commodities of prime necessity, forces are set free to ensure the progress of culture and civilization. But a decline in the relative, and still more in the absolute, figures of the number of persons gainfully occupied in agriculture cannot occur unless the increase in the productivity of agricultural labour is greater than that in the demand for agricultural products. It is only because this condition was prevalent in world economy during the past century, that an ever larger portion in the rising generation of the agricultural population could be and, indeed, was compelled to turn to non-agricultural occupations. Where the migration was taking place and what was its intensity depended upon numerous secondary economic and social factors.

Much time elapsed before these facts were duly investigated and were assigned the central place due to them in all considerations on the subject (1). Only thus is it possible to obtain the right starting point for judging the complex problems arising from the migration from agriculture and the decline in the number of persons gainfully occupied in agriculture.

The interdependence between the migration from agriculture, the productivity of agricultural labour and the demand for agricultural products may be explained as follows: the number of workers required by a branch of economic activity is determined—from the purely economic standpoint—on the one hand by the average output per worker and, on the other, by the volume of the demand for the products in question. With a change in the ratio between labour productivity and demand, the number of workers would also be altered. Thus the number of workers must increase when, with an increase in demand, the return per person does not increase in proportion to the demand; on the other hand, it

(1) A very comprehensive contribution to the explanation of the problem is given by P. QUANTE in the work quoted above. Special mention should also be made of the following:

STEINEMANN, Eugen: Die volkswirtschaftliche Bedeutung der Landflucht. Zurich, 1934.

VANCE, Rupert B.: Research Memorandum on Population Redistribution within the United States. New York, 1938.

WALLACE, Henry A.: Impact of Technology. Technology, Corporation and the General Welfare. Chapel Hill, University of North Carolina Press, 1937.

GOODRICH, Carter and others: Migration and Economic Opportunity. Philadelphia, 1936.

GENERAL CONDITIONS AND TENDENCIES INFLUENCING THE NATION'S LAND REQUIREMENTS. Part I of the Supplementary Report of the Land planning Committee to the National Resources Board. Washington, 1936.

THE PROBLEMS OF A CHANGING POPULATION. Report of the Committee on Population Problems to the National Resources Committee. Washington, 1938.

RECENT SOCIAL TRENDS IN THE UNITED STATES. Report of the President's Research Committee on social Trends, Vol. I. New York, 1933 (see especially contributions by O. E. BAKER, Ralph G. HURLIN and J. H. KOLB).

will decrease when, the demand remaining unchanged, the return increases or when the return increases to a greater extent than does the demand. On the contrary, the number of workers remains the same if the demand and the return alter in the same sense and in the same degree. Supposing that the average consumption per head of the total population remains unaltered, the following situation would arise: If the rate of increase of the total population is greater than that of the average productivity of labour in the branch of production concerned, the absolute number of workers must increase, and if the productivity diminishes, the number must increase relatively as well (in relation to the total gainfully occupied population). If on the other hand, the total population and the average productivity of labour increase to the same extent, the number of workers, in absolute figures, will remain the same, but there will be a decline in the relative figures. Lastly, if the average productivity of labour increases to a greater extent than does the total population, the number of workers required will decline both in absolute and relative figures. A corresponding situation will be determined if consumption per head is altered or if there is a simultaneous change in the consumption per head and in the number of population.

The application of these general observations to the migration from agriculture to other occupations calls for a reply to the question: what, during the past decades, were the changes in the return on agricultural labour on the one hand, and in the demand for agricultural products, on the other?

The evolution of the productivity of agricultural labour.

The countless forms of technical progress which, during the past century, led to a constant increase in the agricultural population's capacity to provide for the needs of non-agricultural population in agricultural products can be grouped under the following three heads:

(1) the progress of agricultural technique;
(2) the progress in transport facilities;
(3) the progress in the national and international division of labour.

The enormous progress made in the technical methods of agricultural production is undoubtedly the most striking point. The various stages of this evolution, which originated at the beginning of the last century and, to be exact, in the more progressive European countries, can be mentioned in this article only briefly. At that epoch during a few decades the numerous ties of the old organization of agriculture which hindered progress were abolished in almost every European country and in this way the preliminary conditions for a more rational cultivation of the soil were created. From one decade to another the old three-course system gradually lost ground and new and more productive crops were introduced which improved the fertility of the soil. By means of improved fodder it became possible to increase the number of livestock and their return. The larger quantities of manure produced and the gradual improvement of technical methods used in cultivation soon brought about a considerable increase in returns. Thanks to Liebig's studies, the results of research in the field of the physical and natural scien-

ces, and above all in chemistry, were made available for agriculture, and the use of chemical fertilizers became widespread. Moreover, during the second half of the past century, the progress achieved in plant and animal selection, the fight against plant diseases and pests, the improved methods of caring for livestock, the carrying out of soil improvements and, to a great extent also, the gradual raising of the cultural level of the rural population as a result of better educational facilities and of expert advice, all became important factors leading to increased returns.

All these efforts tending towards an increase in the return of agriculture were greatly furthered or even made possible by the progress registered in the manufacture of agricultural implements and machinery. New implements and machines, all of improved quality, reduced and facilitated human labour and made it possible to extend and increase production by means of a better, more intensive and quicker tillage of the soil. A far-reaching transformation occurred with the substitution of iron ploughs and cultivators for wooden ploughs, with the introduction of seed-drills, mowers, threshers, fertilizer distributors and lastly the harvester threshers, as well as of various other modern harvesting, sorting and crop-preparing machinery and of milking and other dairy equipment. A new stage in the mechanization of farm work began at the end of the last century with the introduction of electric and internal combustion engines and later with the construction of rubber tired all-purpose tractors.

The second group deals with *progress made in connection with transport and communications*. This not only made possible the extension of cultivation over large hitherto unexploited areas, especially in new countries, and the incorporation in world economy of highly productive colonial territories, but also created the preliminary conditions for a more intensive exploitation of the soil already under cultivation. Everyone knows to what extent and in what way the degree of intensity has been influenced by the improvement of transport facilities and, consequently, of marketing possibilities, so that we need not discuss this subject here. Similar to those of the advances achieved in the technique of transport proper were the effects of the progress made in increasing the transportability of products, such as the development of suitable methods of packing, the improvements in the technique of preservation by freezing and refrigeration, etc.

Although some regions were severely affected by the displacement of production as a result of the evolution in transport, the final result of this movement, in the case both of national and of world economy, has been a considerable increase in the agricultural population's capacity for producing the supplies required by the non-agricultural population.

The third group refers to the *progressive evolution of the social division of labour*. This evolution, which, in Europe, was to a certain extent interrupted in the 16th century and made but slight progress in the next two centuries, entered upon a new phase in the 19th century. Numerous factors which had a mutual influence one upon the other, such as the development of transport facilities and

of industrial technique and production, as well as the abolition of various legal bonds rooted in the old economic organization, steadily increased the pace of this evolution.

Thus, there has been an increasing transfer of various forms of productive activity from agriculture to other or new occupations. In the first instance, this applied to traditional branches of domestic work for the family's own consumption, as well as to the processing and transformation of agricultural products for sale, the marketing of products properly so-called, the manufacture of implements and the production of other farm equipment. Owing to the great diversity of conditions existing in the different cases, the course of development changed from one farm to another and from one country to another, the more so because the economic factors were not the only ones in play.

In the course of the general economic development such operations as spinning, weaving, the making of clothes and the manufacture of household utensils were transferred from the farms to industry. Even the processing of agricultural products for the market has been taken away from agriculture, as for instance, the transformation of milk into butter and cheese. As time passed, a completely independent foodstuff industry formed itself outside of agriculture, gradually taking over the transformation and preparation of foodstuffs, even for a large proportion of the agricultural population as, for instance, the slaughtering of livestock, breadmaking and food preservation. In the same way, but, as a rule, even more rapidly, the manufacture of farm implements formerly made on the farms themselves was transferred to other industries. In the progressive countries, it is a long time since the great majority of implements required for field work or used in the farmyard and stables were manufactured on the farm itself or since the necessary repair work was done by the farmer.

This was the way in which the old domestic economy was reduced in all the more advanced countries to very small proportions. The rural population confined themselves more and more to the production of foodstuffs and of raw materials for industry, in other words to agricultural activity in the strict sense of the term. The reason why farms even in the most advanced countries have preserved the habit of carrying out many operations for family consumption, which, considered from the purely commercial point of view, are hardly remunerative, lies solely in the tendency of the rural population to maintain the traditional customs and usages, in their frugality, in the need to utilize surplus labour and in the fact that the life of the farm, and that of the peasant farm in particular, has never been exclusively ruled by economic laws. The weaker the ties of tradition, however, the more quickly and completely did a general dissolution of the old domestic economy occur. In the vast areas where single-crop farming, the creation of modern world economy, predominates, a complete separation has actually taken place, with the result that, for supplies of foodstuffs and other commodities of prime necessity, the agricultural population as a rule depends on the market just as does any other consumer.

Obviously, the evolution described above set free a great number of agricultural workers. This surplus labour could either follow in the wake of the operations taken from agricultural production or be used for its intensification. Besides, not

infrequently it happened that the evolution took place in such a way that the operations which had formerly been done during the slack periods of agricultural work, became the principal occupation, while agricultural work receded to the position of secondary occupation.

This does not, however, exhaust the question of the division of labour. Ever since the last decades of the past century, the productive capacity of the agricultural population has also greatly increased as a result of the *steadily increasing division of labour both on an international scale and in the agriculture of each particular country*. The technical improvements in transport which afford greater liberty in the choice of the branches of production and of farming systems greatly facilitate the adaptation of these latter to natural and other conditions, thus enabling output to be increased. This is how the production of numerous commodities has been transferred to particularly suitable regions and farms with a productivity of labour much above the average. As a result, conditions were often created which particularly favoured progress, and above all helped the rapid diffusion of better methods of production or the spread of the use of implements and machinery enabling the farmer to obtain better returns. For instance, a remarkable stimulus was given to progress by the partial transfer of seed production and the rearing of improved breeding stock to special farms where it was possible to make use of all the knowledge accumulated by scientific research and practical experience.

Lastly, the *substitution of agricultural products with products obtained from industry* also belongs to the great process of the progressive division of labour. Thus, to give only a few examples, vegetable dyes have been increasingly replaced by synthetic dyes and, in many branches, vegetable oils by mineral oils. Again, besides wool, cotton and natural silk, the textile industry has been enriched by a new raw material consisting of artificial fibres of the most varied origin.

Above all, we must not however forget to mention, in this connection, the substitution of motor power for animal power. In this way, vast areas which so far had been required for fodder for the draught animals, were set free for productive livestock or other crops. This evolution was particularly marked in the United States. As a result of mechanization, the number of horses and mules in agriculture declined steadily after 1919, the year in which it had reached a peak with 26.7 million head, falling to 14.6 million head in 1941. For the same reason, the number of horses not used in agriculture, dropped from 2 millions in round figures to a few hundred thousand, so that, during the period between 1919 and 1941, it may be estimated that the number of horses and mules declined as a whole by approximately 14 millions. Now, since the area required for fodder for each horse is as a rule estimated at 3 acres, during the period mentioned above some 40 million acres were set free for other crops ([1]).

Doubtless, so far this evolution has not assumed the same proportions in any other country, but everywhere the same forces were at work. Although in some

([1]) See: U. S. Department of Commerce, Bureau of the Census: The Farm Horse. Washington, 1933.

countries the number of horses used for agriculture still increased, this was only due to the progressive extension and intensification of agricultural production. It is probable, however, that in this case, too, the area of fodder crops declined considerably owing to an increase in unit yield.

The increase in the capacity of agricultural labour to meet the needs of the non-agricultural population, an increase due to a variety of factors, was—as all economic evolution—not continuous, but intermittent. Special circumstances either accelerated or slackened its pace. The war of 1914-1918, for instance, caused a striking acceleration, principally as regards mechanization. This war brought about changes which under other circumstance would have required many decades. Then, during the last twenty years, the progress made in world agriculture as a whole has advanced at a truly revolutionary pace, many of the symptoms recalling the period of violent expansion of the industrial capitalism towards the end of last century.

Not only the rate of progress differed from one country to the other, but the objects pursued were also completely different. The most striking difference is found between the essentially peasant agriculture of the countries of older civilization and the agriculture of the new countries unhampered by social ties and by a traditional organization of production. In the former it was almost always a matter of obtaining the maximum possible yield per unit of area by means of careful cultivation of the soil, fertilizing, works of improvement and a rational vegetal and animal selection; in the latter, on the contrary, vast areas were available for exploitation, the main objective being to obtain the maximum possible output per worker through the use of specialized machinery. Thus, the principal criterion of progress in the first case is the yield per unit of area and in the second case, the yield per worker.

Just as the progress took place at different times in the different countries, the rhythm in each case being different, so, in the various farms in the same country or region, it did not originate simultaneously. The vanguard of progress was always represented by farms belonging to certain size groups or the new developments happened to be best suited to their possibilities. For a variety of reasons the majority of the rural population was slow in making progress, with the result that the average productivity of labour also increased but slowly. This is doubtless the reason why the importance of the evolution as a whole often failed to be duly realized, and why, above all, it was underestimated. Matters were quite the reverse in industry where such a great difference between the possible and effective productivity occurred but rarely and only for a brief space of time.

* * *

The extent of the total increase in the efficiency of agricultural labour cannot be proved exactly in figures; it can only be vaguely indicated. Looking through the works dealing with this subject, many data are found bearing upon the increase in the yields of crops and livestock. Here, we are interested rather

in the increase in the average yield per person gainfully occupied in agriculture than in the increase in the unit output of particular products. Many difficulties are encountered, however, in making such a calculation and extensive statistical records are necessary. Consequently data of this kind are available only for a few countries and it will easily be understood that they serve merely as an indication of the real evolution.

Very instructive figures are available concerning the development of the productivity of agriculture in the United States. Their value is enhanced by the fact that through them it is possible to make a comparison with the increase in the productivity in manufacturing industries and in mining. As shown in Table 9, between 1870 and 1930 a great increase took place in labour productivity in all these three branches. In mining the increase was the greatest (4.08 times), in the manufacturing industries it was the most stable (2.55 times), while in agriculture (2.44 times), it almost equalled that in the manufacturing industries. In agiculture a rapid increase in productivity was at first noted during the period preceding 1900. Things remained stationary during the next ten years, but this should probably be attributed to the fact that the number of persons registered in the 1910 Census as being gainfully occupied in agriculture was exaggerated. During the next twenty years the increase in output per worker was again fairly considerable and not less than that which took place in the manufacturing industries, productivity per worker increasing between 1910 and 1930 by 41 per cent. in agriculture and by 39 per cent. in the manufacturing industries. There is no doubt that the productivity of agricultural labour continued to increase even after 1930. It is, however, rather difficult to establish the exact figure, owing to the wide fluctuations in the harvests and to agricultural production being subject to control ([1]).

TABLE 9. — United States: *Physical Productivity per Worker by Census Periods, 1870 to 1930.*

(1900 productivity = 100)

Census year	Agriculture	Manufacturing	Mining
1870	58	64	36
1880	77	75	56
1890	82	93	84
1900	100	100	100
1910	100	117	104
1920	119	131	139
1930	141	163	147

Source: M. EZEKIEL; Population and Unemployment. In: *The Annals of the American Academy of Political and Social Science*, November 1936, Philadelphia.

([1]) For the evolution of productivity, after 1930, see: Productivity of Farm Labor, 1909 to 1938. *Monthly Labour Review*, August, 1939, Washington.

The almost equal increase in labour productivity which took place in agriculture and in the manufacturing industries will at first sight be surprising since it is usually thought that the progress made by the manufacturing industries in this respect was much greater than that made by agriculture. This is due primarily to the fact that attention is focussed rather upon the astonishing progress made in certain manufacturing industries particularly suited for mechanization, than on the progress made by manufacturing industry as a whole. Moreover, it is easily forgotten that in the manufacturing industries the substitution of labour by machinery always involves a shifting of labour from one manufacturing branch to another, but that an increase in labour productivity in manufacturing industry as a whole only exists in so far as it brings about a reduction in the total amount of labour employed. In agriculture, on the contrary, any substitution of labour by machinery is equivalent, as emphasized by Steinemann in particular, to an " effective increase in the productivity of agricultural labour as a whole", whether " the machine works equally or less efficiently than the worker it replaces, since the machine which replaces the worker is not built by agricultural workers, but is the product of non-agricultural labour" (1). Besides, a remarkable difference to be observed between the development of agricultural and industrial productivity lies in the fact that, in industry, where the pressure towards levelling is much stronger and encounters fewer obstacles, the deviations from the average productivity are much less marked than in agriculture where the proportion of very backward farms with low productivity generally is very high.

Besides the figures for the United States, statistics bearing upon the increase in agricultural productivity are also available for Germany. According to Table 10 which is based on data compiled by the German Institute for Economic Research, the volume of production per hectare of agricultural area has increased from 100 in 1880 to 246 in 1939-40. Since the number of persons depending on agriculture per hectare of agricultural area has declined constantly, the volume of production per person depending on agriculture has increased to a still greater degree, namely from 100 in 1880 to 305 in 1939-40. A comparison of these figures with those for the United States is interesting chiefly because the preliminary conditions for the increase in productivity of agricultural labour are absolutely different in these two countries. It might be supposed that the increase would be greater in the United States, where agriculture makes much more extensive use of the modern labour saving machinery. It will be seen from the comparison, however, that this is not the case. In the United States the productivity of agricultural labour increased from 100 in 1880 to 183 in 1930, while in Germany, during the same period, it rose from 100 to 238. It is true that the German farmer was far from being able to increase the cultivated area to the same extent as the American farmer but, in exchange, he exploited, in a very much greater degree, all the possibilities of an increase in yield per hectare of area. Thus,

(1) STEINEMANN, E: *Op. cit.* p. 27.

for instance, in 1934-38 the average yield for wheat in the United States was 8.7 metric quintals as against 22.8 in Germany; for rye the figures were 7.7 and 17.3 metric quintals respectively, for barley 11.5 and 21.6 and for oats 9.8 and 20.2 metric quintals.

TABLE 10. — Germany: *Increase in agricultural productivity, 1880 to 1940.*

(1880 = 100)

Year	Agricultural area	Persons depending on agriculture		Volume of production		Volume of production per person depending on agriculture
		total	per hectare of agricultural area	total	per hectare of agricultural area	
1. Territory before the world war						
about 1880	100	100	100	100	100	100
about 1890	99	98	98	118	120	121
about 1900	99	95	96	114	146	152
about 1913	98	90	93	182	186	202
2. Territory after the world war						
1927/28	83	74	89	158	192	213
1928/29	82	73	89	165	200	225
1929/30	82	73	87	169	206	233
1930/31	82	72	87	172	209	238
1931/32	82	72	87	174	212	243
1932/33	82	71	85	166	202	233
1933/34	82	71	85	178	216	249
1934/35	82	71	85	185	225	259
1935/36	81	71	87	178	221	249
1936/37	81	70	85	184	228	264
1937/38	81	68	83	193	240	284
1938/39	80	66	81	191	239	289
1939/40	80	64	80	196	246	305

Source: SCHMITT, L.: Die Leistungen des deutschen Bodens. In: *Forschungsdienst*, Band 12, Heft 1 Berlin, 1941, p. 12.

The part played by the various factors in the increase of productivity differs from one country to another, according to the character of production. From the standpoint of world economy, however, primary importance should undoubtedly be attributed to the progress of mechanization. There are numerous calculations which show the influence of the use of machinery upon the labour requirements of agriculture. We shall quote here only some calculations referring to the United States, where, for obvious reasons, these matters have often been the object of special investigation.

According to Wallace [1], the production of a bushel of wheat in the United States required 1.2 man-hours in 1880 and only 0.5 man-hours in 1937. According to the estimates of the National Research Project, the labour requirement per unit of production underwent the following evolution [2]:

Crop	Un	Man hours per unit 1909-13	Man hours per unit 1934-36	Percentage decrease of man hours per unit
Maize	bushel	1.09	(1) 0.90	17
Potatoes	bushel	0.79	0.64	19
Cotton	bale	(2) 271.00	(3) 218.00	20
Sugar beets	ton	(4) 11.20	8.70	22
Oats	bushel	0.42	0.27	36
Wheat	bushel	0.89	0.41	54

(1) 1932-36. — (2) 1917-21. — (3) 1933-36. — (4) 1913-17.

The increase in labour yield shown by these figures is, however, not exclusively due to mechanization and to the technical progress in machine building. The yield per unit of area increased by about one tenth in the case of sugar beets, potatoes and cotton; the yields for wheat, maize and oats, on the contrary, were lower during the period from 1932 to 1936 than between 1909 and 1913.

The figures under review refer to the total production in the United States, but there are considerable differences between the various parts of the country. Thus, in Kansas and Nebraska, the labour requirement for the production of a bushel of maize amounted to only 0.67 man-hours even during the period from 1909 to 1913, falling to 0.44 between 1932 and 1936, while an extensive use of labour was made in South Carolina, Alabama and Georgia, where the respective figures amounted to 3.10 in 1909-1913 and to 3.15 in 1932-36. The differences were no less important in the case of other products. While the labour requirement in California for the production of a bushel of wheat fell from an average of 0.75 man-hours between 1909 and 1913 to an average of 0.18 during the period 1934-36, in South Carolina, Alabama and Georgia it dropped only from the relatively high figure of 1.87 man hours on an average between 1909-13 to an average of 1.70 man-hours during the period 1934-36.

(1) WALLACE, Henry A.: *Op. cit.*

(2) U. S. WORKS PROGRESS ADMINISTRATION. National Research Project on Reemployment Opportunities and Recent Changes in Industrial Techniques: Studies of Changing Techniques and Employment in Agriculture. Report No. A-1 (Sugar Beets), A-4 (Potatoes), A-5 (Corn), A-7 (Cotton), A-10 (Wheat and Oats). Philadelphia, 1937-1939.

The evolution of the demand for agricultural products.

The total consumption of agricultural products is determined by two factors: consumption per head and number of population.

As regards the evolution of consumption per head there are essential differences between foodstuffs and agricultural raw materials destined for industry. In the former case, we find that every case, however different may be the quantity of foodstuffs required for consumption, a saturation limit exists which is exceeded only under exceptional circumstances. It is nevertheless important to know by means of which particular foodstuffs the saturation is reached. Along with an increase in welfare, diet generally becomes more refined, because the consumption of foodstuffs rich in carbohydrates (such as cereals and potatoes) is replaced to a greater or less extent by animal products, fruit and vegetables. This evolution, dating far back in the past century and closely connected with the progress of urbanization and with the change in the living and working conditions of the population, has had a great influence on world agriculture. The great increase in the average consumption of animal products, fruit and vegetables, constantly created new possibilities as regards agricultural production and labour. Supposing that the consumption per head of these products between 1925 and 1935 had not exceeded the figure registered about the middle of last century, a very great number of farms in the non-European countries producing for the world market and as many others in Europe would not have been able to exist.

But the qualitative improvement of diet has its limits, and it seems that for a number of products these limits have been reached in many countries during the last few decades. Indeed, opposition did not fail to appear when, under the pressure of the last great agricultural depression, proposals and attempts were constantly being made to combat the bad agricultural situation by encouraging the consumption of animal products and, in other cases, of fruit and vegeables, in order to raise the profitableness of agriculture and, above all, to guarantee the greatest possible employment of labour in this branch. Leading agricultural economists (1) in different countries have warned against exaggerated optim-

(1) See the following selection from the many works on the subject:

BRINKMANN, Th.: Schicksalsfragen der deutschen Landwirtschaft. In: *Deutsche Agrarpolitik*, Part I. Berlin, 1932.

BURGDÖRFER, F.: Bevölkerungsentwicklung, Wirtschaftsstruktur und landwirtschaftlicher Absatz. *Ibidem.*

THE AGRICULTURAL DILEMMA. A report of an enquiry organised by Viscount ASTOR and Mr. B. SEEBOHM ROWNTREE. London, 1935.

BAKER, O. E.: Commercial Agriculture and the National Welfare. U. S. Dept. of Agriculture, 1935.

GOODRICH and others: *Op. cit*

WAITE, Warren C. and BLACK, John D. : Nutrition and Agricultural Policy. In: *The Annals of the American Academy of Political and Social Science.* Vol. 188, Nov. 1936. Philadelpia, 1936.

THE PROBLEMS OF A CHANGING POPULATION, *Op. cit.*

ism, by drawing attention to the fact that qualitative improvement in diet might lead at best to a notable increase in the total amount of production of agriculture in certain limited areas, but not in that of agriculture in the larger countries and still less in world economy; they also observed that the idea that surplus labour could thus be absorbed was unfounded. Although the consumption of some products continued to increase (eggs, milk, butter, fruit and vegetables, for instance), this increase, which did not depend solely on a preference for one food or another, but also on purchasing capacity, would proceed very slowly and would consequently give agriculture ample time to satisfy the growing demand by intensification and by making use of all technical possibilities without being obliged to increase the number of persons employed. Here and there the increase in purchasing power and consequently, the shift in demand, might take place violently and might even last fairly long, but in the case of countries as a whole, and especially in the case of world economy, the evolution would necessarily be but slow. Lastly, it should not be forgotten that large quantities of the products in question (as in the case of fruit, vegetables, poultry products, etc.) are furnished not by agriculture properly so-called, but by family gardens and by small livestock rearing exclusively for immediate consumption, and that modern social and housing policy actually encourages this evolution in many countries.

Unlike that of foodstuffs, the consumption per head of agricultural raw materials for industry is capable of great expansion. In this case, as in that of industrial commodities in general, there is no physiological point of saturation. Indeed, with the rise in purchasing capacity, the demand for many agricultural raw materials has also increased considerably, providing work and bread for many people. But, on the other hand, the future importance of this evolution, especially from the standpoint of world agriculture, must not be overestimated, the more so because the tendency to replace agricultural raw materials by materials of industrial origin, has been steadily increasing during recent years, and seems to have gained a firmfooting.

The future evolution of demand for agricultural products in the leading countries of the world market will therefore mostly depend on the development of the population. Now, what are the data which enable us to judge this development? We shall attempt here briefly to answer this question.

In the course of the XIX century there has been an unprecedented increase in the world's population. Unfortunately, no exact figures are available in this connection and one is often compelled to fall back upon estimates. According to Carr-Saunders [1] the world population increased during the XIX century from 906 million to 1,608 million persons, or by 77.5 per cent. During the same period, the population of Europe more than doubled, increasing from 187 to 401 millions. The relative increase was very much greater in the new countries; in North America the increase registered was from 5.7 to 81 millions, in Central and South

[1] CARR-SAUNDERS, A. M.: World Population. Past Growth and Present Trends. Oxford, 1936.

America from 18.9 to 63 millions and in Oceania from 2 to 6 million persons. The extent of this general increase was due in part to a rise in the birth-rate, but chiefly to a decline in the death-rate.

But already during the last century there have been signs of a coming change. From decade to decade the number of countries increased where the birth-rate reached a peak, after which it began little by little to decline. In France this maximum had already been reached at the outset of the last century. Turning to the other European countries the same situation is to be found in the course of the following decades in Ireland, Denmark, Sweden and Norway; from 1870 to 1880 it appeared in Germany, Belgium, the Netherlands, England, European Russia, Austria, Switzerland, and Spain and from 1880 to 1890 in Italy and Hungary and, lastly, during the second decade of the present century, in Romania and Bulgaria. Insofar as the figures showing this development are available, we find that from 1851 to 1860 only one European country, namely, France, had an annual average rate of live-births below 30 (26,2) per thousand inhabitants. It was not until the period from 1881 to 1890 that another country, Switzerland, registered a live-birth rate below 30 (28.3) per thousand inhabitants, but during the next decade such countries already numbered five, *i. e.* : France (22.1), Sweden (27.1), Switzerland (28.1), Belgium (28.9), and England (29.9). In 1913 France was once more alone with a live birth-rate of less than 20 (18.8 per thousand inhabitants). In 1938, when the extremely low birth-rate registered during the years of depression had been overcome, the figures were below 20 per thousand inhabitants in the following European countries: France (14.7), Sweden (14.9), Luxembourg (14.9), Switzerland (15.2), Great Britain and North Ireland (15.5), Norway (15.6), Belgium (15.8), Esthonia (16.3), Czechoslowakia (16.8), Denmark (18.1), Latvia (18.4), Ireland (19.4), Germany (19.6) and Iceland (19.7).

TABLE 11. — *Estimates of the population of the world.*

(in millions)

Continents	1650	1750	1800	1850	1900	1933
Europe	100	140	187	266	401	519
North America	1	1.3	5.7	26	81	137
Central and South America	12	11.1	18.9	33	63	125
Oceania	2	2	2	2	6	10
Africa	100	95	90	95	120	145
Asia	330	479	602	749	937	1,121
World total	545	728	906	1,171	1,608	2,057

Source: CARR-SAUNDERS, A. M.: World Population. Past Growth and Present Trends. Oxford, 1936.

The evolution in countries of European colonization in other parts of the world was similar to that observed in Europe. In the United States the decline in the birth-rate began about the beginning of the last century. According to estimates made by Thompson and Whelpton (1) birth registration was only organized in 1915), the birth-rate of the white population dropped from 55.0 per thousand inhabitants in 1800 to 43.3 in 1850, 30.1 in 1900, 27.4 in 1910, 26.1 in 1920 and 20.1 in 1930. During the following years the number of live births was still smaller, falling to 16.1 in 1933; after 1933 it rose slightly, it is true, but in 1938 it was as low as 17.2 and in 1939 reached 16.9. The birth-rate among the non-white population in the United States also declined steadily and was 21.2 in 1938.

The following figures will give an idea of the changes which have occurred in the birth-rate in other countries with a population of European origin. In 1938, the birth-rate of the white population in Australia had fallen to 17.5, in New Zealand to 19.3, in Canada to 20.5, in Argentina to 24.1 and in the Union of South Africa to 25.0.

During the past twenty years the declining birth-rate extended still further beyond the frontiers of the western countries. Only the evolution registered in Japan and British India will be mentioned here. In Japan, at the beginning of the Meiji era, the figure for births was fairly low; the average for the years 1872-75 was 22.8 per thousand inhabitants, and consequently lower than that registered anywhere in Europe. During the years which followed, on the contrary, a steady upward movement took place. The highest five-years average (34.6) was reached in the period 1921-25, and the highest annual figure (36.2). was registered in 1920. Since then there has been, a slow decline, the figures falling to 33.6 in 1926-30, to 31.7 in 1931-35, to 30.0 in 1936, 30.8 in 1937 and 27.0 in 1938. In British India the trend was similarly downwards. The average number of births decreased in this country from 38.6 during the years 1911-13 to 34.4 in 1931-35 and 33.0 in 1939.

If for a long time little importance was attached to the general decline in the birth-rate, this was because, as a result of the great progress made in hygiene and medicine and the general improvement in the standard of living, the death-rate was steadily declining simultaneously and almost always to a greater extent than did the birth-rate, so that, the rate of natural increase of the population not only remained the same, but could even sometimes increase considerably. This fact was looked upon as being decisive. The decline in the birth-rate did not stop, however, and a further limitation of the death-rate becoming increasingly difficult after each new advance, it was inevitable that, sooner or later, a point would be reached when the decline in the birth-rate would be in excess of the decrease in mortality. Indeed, this was the case in all civilized countries, however great might be the differences revealed by the birth-rate, the death-rate and the increase in population. Sometimes earlier, sometimes later,

(1) THOMPSON, Warren S. and WHELPTON, P. K.: Population Trends in the United States. New York, 1933.

at times after only a few years and at others after decades, the excess of births over deaths also began to decline. In some countries, the birth rate declined to such an extent during recent decades that, although the mortality was at a minimum, it no longer sufficed in the end to keep up the population. For the time being this fact may not be revealed by the crude surplus of births, but it appears clearly if the surplus births are compared with a population whose age structure is " normal ".

The variations of the average expectation of life at birth make it possible to see to what extent the increase in population during the past decades may be attributed to the decline in mortality. Indeed, to mention only a few examples, the average expectation of life at birth of live male infants rose in Germany from 35.6 years in 1871-1880 to 47.4 in 1910-11 and to 59.9 in 1932-34; in Massachusetts it rose from 34.5 in 1789 to 41.7 in 1878-82, 49.3 in 1909-11 and to 58.1 in 1929; lastly, in Italy, it increased from 35.2 in 1981-82 to 46.6 in 1910-12 and to 53.8 in 1930-32.

Productivity of agricultural labour, demand for agricultural products and number of persons gainfully occupied in world agriculture.

What then is the relation between the evolution of demand for agricultural products and the great increase in the productivity of agricultural labour, and how have these two factors affected the number of persons gainfully occupied in world agriculture ?

During the fifty years which preceded the war of 1914-1918, as has already been shown above, there was a very great and continuous increase in the demand for agricultural products. In the countries exercising a decisive influence upon the world market, the population increased with unprecedented rapidity, and the general rise in the standards of living led to a great increase in consumption per inhabitant.

The increased demand was mainly met by means of an increase in the productivity of agricultural labour. The latter even became temporarily so great that it forestalled the increase in demand. As a general rule, however, the increase in demand was more rapid. The increase in productivity alone was therefore insufficient, and the number of persons gainfully occupied in world agriculture also augmented. Compared with the general increase in the population, the increase in the number of persons gainfully occupied in agriculture was, however, small, so that the share of these persons in the total gainfully occupied population declined steadily.

Now, the increase in population gainfully occupied in world agriculture was far from being evenly distributed throughout the various countries. It was concentrated wherever the productivity of labour increased most rapidly, that is in the new countries. In these countries, large fertile plains, which had never previously been exploited by any productive organization, as well as favourable climatic conditions, enabled agriculture to secure a high yield per unit of labour, especially when improved machinery and implements were used. The maintenance of the fertility of the soil, at the outset, did not matter; what was sought

was only the highest possible output per worker. In the beginning it was undoubtedly, and perhaps solely, because of the limited use of labour per unit of various staple products that it was possible for agriculture in these countries, in spite of the cost of transport which, at that epoch, was still very high, to guarantee the sale of their products by asking a lower price than that then ruling on the world market, and thus to attract increasing numbers of people. Agriculture in the old world found it difficult to face this competition, because the conditions of production, the ties of the social and technical structure which had formed themselves in the course of centuries, made the situation in the Old World very different. Such an increase in the productivity of labour, by concentrating production upon a limited number of commodities, was quite impossible for the agriculture of the Old World.

As the economic policy tended chiefly towards eliminating all obstacles to international trade, there was but one alternative for the agricultural population in European countries: to abandon agriculture in ever increasing numbers, or else to content itself with an income even smaller than before. In the countries where industry had been expanding rapidly, part of the agricultural population found industrial employment, while others emigrated to the regions newly incorporated in world economy. In the less progressive agricultural countries, the pressure of population upon agriculture was much stronger. The exports of agricultural products, which had been gradually and slowly developed, declined again, the population became poorer and people began to emigrate from these countries as well. In so far as data are available for countries in the Old World concerning the number of persons gainfully occupied in agriculture and of emigrants during this period, this evolution may be clearly observed.

Considered as a whole, the development within so short a period of a world-wide supply system is undoubtedly an extremely imposing phenomenon. Without underestimating the progress or misunderstanding the spirit which characterize this period, if we take a retrospective view of this evolution to-day, we are bound to make important reservations. These reservations, it is true, do not in the first place apply to the withdrawal from agriculture which took place in the Old World. Indeed, this withdrawal gave rise almost everywhere to a sense of relief, because at that time there were vast regions where too many men were living on the farms. The individual lacked the space which could afford sufficient opportunities to his productive capacities. Finally, a vista of unhoped-for possibilities for realizing his ambitions and improving his living conditions opened up before him. How could one see in this anything but a welcome sign of progress?

The drawbacks of this development consisted primarily in two facts, one of which referred to the countries of the New World and the other to those of the Old World.

In the new countries, the increase in agricultural production was almost exclusively due to the extension of the areas under cultivation. At the time there was but little thought of a careful cultivation of the soil. Without troubling about the future, the productive power of the soil accumulated throughout centuries was recklessly exploited. It was a long time before the immense danger resulting to

the country itself from this system of exploitation was recognized. In vast areas, however, the harm was already done; they were irremediably lost to farming; in other regions enormous sums had to be expended if farming was to be continued or if they had to be brought again under cultivation. There is much cause for reflection if one attempts, on the basis of the works published in this connection, to form an idea of the extent of the damage done to the soil in North and South America, as well as in Africa and Australia, by farming methods whose only object was profit (1).

These truly soil-depleting and ruinous farming methods, which for years and years have marked the food production of the world have, on the other hand, up to the presunt, severely hampered the development of European agriculture. Under the pressure of unrestricted competition, which gave precedence over all others to those forms of production which were momentarily the cheapest, in many European countries the advance of agriculture towards progress was often stopped. Vast agricultural regions in Europe could hardly benefit from the large increase in demand, not even from an increase in demand from neighbouring countries. It was not until after they had at great sacrifice adjusted themselves to the new situation by increasing agricultural production and bringing it up to-date, here and there encouraged and stimulated by a suitable foreign trade policy and by other measures taken by the Government, and especially as a result of the still increasing demand, when, on the other hand, the colonization of the new spaces had begun to slow down, that agriculture in many European countries succeeded in finding the way to a general increase in productivity and in competing with overseas countries and even in the case of some products, in outstripping these latter. This is shown by the evolution of the agricultural population of these countries, whose decline slackened considerably towards the end of the century. Whether the equilibrium which was thus being established, but which, of course, was far from affecting every country in the old continent, would be stable, or whether it merely represented a breathing space, is another question.

(1) See also:

SOIL EROSION. A CRITICAL PROBLEM IN AMERICAN AGRICULTURE. Part V of the Supplementary Report of the Land Planning Committee to the National Resources Board. Washington, 1935.

SOILS AND MEN. Yearbook of Agriculture, 1938. United States Department of Agriculture. Washington, 1938.

JACKS, G. V. and WHYTE, R. O.: Erosion and Soil Conservation. *Bulletin of the Herbage Publications Series*, No. 25. Published also in: *Technical Communications from the Imperial Bureau of Soil Science*, No. 36. Aberystwyth and Harpenden, 1938.

JACKS, G. V. and WHYTE, R. O.: The Rape of the Earth. A World Survey of Soil Conservation. London, 1939.

BALLY, W.: Different aspects of soil conservation. Possibilities of international collaboration. In: *Monthly Bulletin of Agricultural Science and Practice*, September 1940. Rome.

STEBBING, E. P.: Man made Desert in Africa. In: *Suppl. Journ. R. African Soc.*, January 1938. London.

BENNETT, H. H. : Soil erosion in the United States. In: *Monthy Bulletin of Agricultural Science and Practice*, June 1941. Rome.

The outbreak of hostilities in 1914 created completely new conditions for the evolution of the productivity of agricultural labour. The decrease in agricultural production in the central and western European countries and the elimination of eastern Europe from the World market opened up unexpected outlets for the production of the New World. Adequate spaces could be devoted there to the extension of crops; what was lacking was labour. As immigration was steadily declining, the only way of profiting by the situation which had arisen on the market, a way which was used to the full, was rapidly to develop the mechanization, and rationalization of agriculture.

An evolution which under other circumstances would probably have taken several decades, now took place in the space of a few years. It was also, however, to a great extent this evolution that had caused one of the greatest agricultural depressions which has ever been known. When the war was over, European agriculture did all in its power to restore production as quickly as possible. It must be recognized that not only was the attempt successful in a very few years, but even the progress of the technique and organization of agricultural production, stimulated by favourable price conditions after the interruption caused by the war, was rapid. But, in the countries of the New World, too, the process of rationalization of agriculture, accelerated by the war and often diverted into new directions, was also making headway. At first the extension of the cultivated areas continued and in animal husbandry attempts were made to hold the positions gained on the world market and even to strengthen them. But, before long, demand could no longer keep pace on the world market with supply, which was much greater than before the war, in spite of the absence of Russia. In many countries consumption could recover but slowly as a result of the impoverishment of many strata of the population, and it had not recovered fully for many years. At the same time, a remarkable change in the evolution of consumption became increasingly evident. The movement towards animal products which, for years, had offered intensive agriculture ever fresh opportunities of work and, as a result of the huge demand for fodder cereals, had afforded extensive agriculture in many countries ever wider marketing possibilities, now lost force. Moreover, a new factor now came into play: the increase in population had slowed down everywhere. The ultimate result was that the increase in supply became greater than that in demand.

Under the conditions described above, the old protectionist policy began once more slowly to gain ground. It was not yet, however, in any way the expression of a fundamental change in the economic policy. Faced with the tremendous difficulties of the period, people watched with all the more admiration and hope the splendid success of the liberal economic policy; collaboration and division of labour on an international scale were once more the ideals to which men aspired It was hoped and believed that with the same means as formerly it might be possible to restore balance and smooth the path of evolution. It was the agricultural population of the Old World that had to meet the cost of this policy in the first place. The situation was still further aggravated for this population because competition from the new agricultural countries was no longer confined to the products of arable farming and of extensive stock-breeding, but in-

volved to an increasing extent the products of intensive stock-breeding and gardening. The agricultural population in several of the European industrial and agricultural countries suffered now even more than before. Whenever there were possibilities of finding other employment, strong migratory currents towards non-agricultural occupations appeared among the agricultural population. The pressure on the population was strongest where natural or economic conditions made the raising of the efficiency of agriculture particularly difficult. Wherever migration was impossible due to lack of openings in other economic branches in the country, or as a result of the greater difficulties encountered by emigration, misery became widespread. In several countries this "latent unemployment" involved a much greater number of people than did migration.

Agricultural production continued to increase in spite of the decline in the number of gainfully occupied persons. As in the other branches of economic activity, the productivity of labour in agriculture increased very considerably in the course of a very few years. But this fact, which should have constituted an element of prosperity, soon became fatal. The marketing of production became increasingly difficult, even at disastrously low prices. Not only was demand restricted by the low purchasing capacity of the masses of unemployed, whose numbers increased steadily with the aggravation of the depression, but the number of new consumers also fell steadily owing to the continuous decline in the birth-rate.

The more serious the depression became, the more the several countries sought to overcome their difficulties by their own efforts. The world-wide organization of food supplies grown up in a hundred years, broke down very quickly. Just as countries which are dependent on imports of agricultural products considered large imports of agricultural products as undesirable, especially when these imports increased even further during the depression, while at the same time unemployment in their industry and agriculture continued and the greatest difficulties were encountered in marketing their own agricultural products, so countries with a surplus of agricultural production looked askance at their great dependence on imports of industrial products. Slowly at first, but with increasing rapidity, the numerous bonds of world economy began to slacken and were partly replaced by imperial or regional combinations. In several industrial countries, dependent to a great extent on the world market for their supplies of foodstuffs, the agricultural policy underwent a radical modification, in some cases in connection with a general change in the fundamental principles ot the economic policy of the nation. The tendency to give absolute preference to national agricultural production as against foreign products became increasingly evident, just as did the tendency to exploit the possibilities of home production much more intensively than previously, and it was not only purely economic considerations which came into play here, but also considerations of a social and demographic nature. The various measures adopted led to the creation of a system of agricultural protection whose aim was to free agriculture from the disturbing influence of changes on the world market and to establish a firm basis for the exploitation of its productive forces.

Naturally there could be no question of a "re-agriculturalization" in the sense or an increased percentage of agricultural population, an increase contem-

plated by many people who had only a superficial knowledge of the economic limitations to this development. The agricultural population was numerically more than adequate almost everywhere to meet all the requirements of increased and intensified production. It could even be expected that an improvement in the returns of agriculture might accelerate rationalization and mechanization, thus frequently setting free more labour, without damage to production. As a matter of fact, however, the withdrawal from agriculture soon assumed quite unforeseen proportions. The mass of unemployed in the towns was still far from being reabsorbed and already the flow of migration from the country was increasing and becoming an impetuous torrent carrying everything before it when, setting aside economic considerations, one country after another subordinated national economic policy to military requirements.

Quite different was the development of the situation in the agricultural countries of the Old World, and especially in those of southern and south-eastern Europe. In these countries the problem which in the last decades assumed an ever growing importance in determining the nation's home and foreign economic policy was that of agricultural overpopulation. A well-known comparison which has often been made is that between the demographic conditions in the agriculture of these countries and that existing in the most progressive agricultural economies in Europe (1); this comparison shows clearly that in the regions in question the density of population is less, it is true, than in Denmark and the Netherlands — where agriculture is in advance of every other European country in respect of intensity and output and has also a typically peasant character — but that the density of the agricultural population per 100 hectares of agricultural area is more than twice as high. Agrarian reform and emigration had made it possible to lighten the effects of overpopulation at least temporarily. The former of these possibilities was now exhausted, and the latter, which encountered increasingly serious obstacles, lost all its value during the depression. Through a gradual development of closer economic relations with neighbouring countries possessing a great capacity of consumption, by means of bilateral trade agreements with fixed deliveries and by an adaptation of their production for export to their needs, these countries could indeed create certain essential conditions for the modernization and intensification of their agriculture, but this enabled them to advance but slowly on the way towards the solution of the problem of their agricultural overpopulation. A solution going deeper to the root of the problem consisted in a simultaneous encouragement of industrialization. As a matter of fact, partly owing to the closest collaboration with neighbouring countries, it has been possible to

(1) See also numerous articles by OTTO VON FRANGEŠ, of which only the two following are quoted below:

Die Bevölkerungsdichte als Triebkraft der Wirtschaftspolitik der südösteuropäischen Bauernstaaten. Kieler Vorträge, Heft 59. Jena, 1939. — L'industrialisation des pays agricoles du sud-est de l'Europe. In: *Revue Economique Internationale*, July, 1938.

accelerate the development of various branches of industry, especially of those which transform raw material supplied by agriculture, forests and mines. In a very few years it has thus been possible to create thousands of new opportunities of employment. Even if this development could not run parallel with the natural increase in the population, which was still relatively high, none the less in many places it afforded a sense of relief to those who remained and who were thus offered *a greater freedom of movement. If it is sought to bring the productivity of agri*cultural labour in these countries to the same level as it has attained in other European countries, it is inevitable that a much larger number of workers than before should be withdrawn from agriculture proper.

The result of a development of world economic relations in this sense since the depression was that the pressure on the world agricultural market of excessive supplies fell with its full weight on the new countries, and it was not long before this also affected the evolution of the agricultural population there. Only the British Dominions were able to avoid this pressure. In conformity with the Imperial Preference Policy inaugurated by the Ottawa Agreements, they were able to secure an increasing share in supplying the mother country, at the expense of other exporters. Thus, as has been seen, their population gainfully occupied in agriculture was able to go on increasing.

III. — The effects of the migration from agriculture on the agricultural population and on national economy.

Space does not permit of our giving a detailed description here of the different effects of the migration from agriculture on those who left the land, as well as on the remaining agricultural population and on national economy. Only some of the outstanding points can be brought forward in this article. Moreover, it is hardly possible to express a definite opinion, since we are dealing here with a tangled combination of economic social, demographic and national questions in judging of which, in their various details or as a whole, much depends upon personal views.

If a judgment is to be formed, it is indispensable that the economic and extra-economic effects should first be considered separately. By economic effects we mean in the first place, those which have influenced the conditions of those who have left agriculture and the situation of those who have remained, the level and distribution of national income and the supply of foodstuffs.

In the following chapter it is, of course, in more than one respect, only a question of completing what has already been said concerning the development and causes of the migration from agriculture to other occupations.

The consequences for those leaving agriculture.

The great mass of those leaving agriculture consisted almost always of young people. Among these, in their turn, children of independent farmers were very numerous; in the peasant regions they even formed the majority. Since they

could not find employment suitable to their social status in agriculture, it was considered quite natural and even desirable that they should adopt some non-agricultural occupation. It was supposed, besides—and this was confirmed by experience and research—that most of these persons would find a much better livelihood in non-agricultural occupations.

What was true of the children of independent farmers held good also, as a rule, for dependents who left agriculture and for their children. It must not be thought, as is still unfortunately all too often the case, and what it is often attempted to prove by wage comparisons, that agricultural workers who leave agriculture do not understand their real advantages or that they allow themselves to be dazzled by the mirage of town life. It is only by choosing another occupation that many of them are able to make full use of their energies and to find work for the whole year or—and this concerns male servants on the peasant farms in general—to found a family. Older workers leave agriculture in order to improve their children's chances for the future.

Some of those who leave agriculture may perhaps become victims of false illusions, but as a rule migration leads to an improvement in their economic conditions. If this were not the case, there would soon be no more talk of migration from agriculture, and after a certain time, as long as the percentage of births remains the same, instead of complaints of a rural exodus, one would hear new complaints of unemployment and overpopulation in the country. This was amply proved by the last great agricultural depression.

As regards the migration from agriculture of independent farmers, this has always been a rare phenomenon, and was caused either by a desperate agricultural situation or by very exceptional demographic conditions in the region in question. Even in this case it only assumed greater proportions when the people involved were not very deeply attached either to agriculture as an occupation or to the soil which they were cultivating.

The consequences for the remaining agricultural population.

Here a distinction should be made between the consequences for agricultural labourers, for independent farmers and for the agricultural population as a whole.

As long as there is no difficulty in satisfying the demand for agricultural labour, migration towards other occupations has but a slight influence on the *situation of the agricultural labourer*. But the more migration absorbs the surplus of agricultural labour, the more existing labour conditions begin to be affected.

The question of knowing to what extent the situation is permanently improved by means of higher wages, better organized working-hours, improved housing conditions, better treatment and more suitable provisions for social welfare, as well as by the introduction of mechanization to facilitate the work, all depends on the profitableness of agriculture. Competition from agriculture in other regions where labour productivity is greater or where for other reasons the costs of production and especially wages, are lower, may make any improvement in agricultural labour conditions impossible. Farmers may also prefer further mechanization and rationalization to a rise in wages. In other cases, they may

alter production or, lastly, employ seasonal workers, and it is not unusual to find that in this way the former structure of agricultural labour is destroyed.

The resulting disadvantages get the upper hand, especially during periods of serious depression. In normal times, however, when agriculture develops smoothly, migration from agriculture may become the most efficacious factor for the improvement of the conditions of agricultural labour.

For *independent farmers*, migration from agriculture represented a numerical limitation of the available labour. If a shortage of labour follows, the consequences are generally the more severely felt the more agriculture is intensive. Among these consequences may be the impossibility of making full use of the productive capacity, a less careful cultivation and finally a sensible decline in production. The maintenance of intensive or particularly remunerative branches of production may become precarious, and more extensive farming may become unavoidable. Doubtless, these consequences may have been observed in many places, but exaggeration or generalization must be avoided in this connection also.

Migration may lead to a particularly difficult situation on peasant farms, and this not only on the larger of these, but also on the smaller family farms where there are always, from generation to generation, more or less long periods in which the family's work is not sufficient and has to be supplemented by paid labour. Exaggerated migration of farm servants easily leads, in this case, to overwork for the members of the family. This is likely to create discontent and dislike of farm work, especially when the return for long days of work is not at all in proportion to what might be obtained in other occupations. The vocational instruction of the future managers of farms often suffers from this also. Overwork among peasant women forms a chapter apart.

But the size of farms and the density of population remains always a decisive factor in forming a judgment. In overpopulated regions of small peasat farms, the migration from agriculture can only be beneficial. The greater the migration, the more room is there left for those who remain. If small owners leave agriculture, more land comes on the market and will offer other small farmers the chance to increase their farms to a size allowing a wider use of modern technical devices. What is true of overpopulated regions of small peasant farms is equally true of regions where natural conditions are unfavourable, such as mountainous regions where the conditions do not permit of intensive methods of cultivation and where only through migration can farms of convenient size be created.

In conclusion, it may be said that excessive migration, and only this, may create infinite difficulties for the independent farmer. Complaints have always been made on this subject, in all progressive countries, and have increased along with the development of migration. On the other hand, however, migration gave strong impetus to progress in farming technique, as well as to the improvement of the situation of agricultural labourers and, consequently, also of the whole agricultural population. No one would wish to cancel this progress. Moreover, the difficulties which had so frequently to be faced by farm operators, lay not so much in the total loss caused by the migration of labour over several

decades, as in the irregularity of this movement with its violent ups and downs which precluded the possibility of a smooth and gradual adjustment to the situation.

Other effects of the migration from agriculture towards other occupations concern the ***agricultural population as a whole,*** and often in the same way the entire rural population.

When the withdrawal from agriculture is the result of overpopulation and contributes towards a reduction in the disproportion between the earning possibilities and the number of workers, it cannot but be welcomed. The same may not be said when it is in excess of what is needed for the adjustment of the population to the earning possibilities. In this case, the whole economic evolution of the region may be put into a critical situation. This is particularly true of regions with sparse population in which the municipal charges have to be distributed over a small number of persons. Here, all initiative is easily paralysed by the migratory movement, because, in these regions as elsewhere, it is the most active members of the community that mostly follow the migratory stream towards the town.

A considerable liability for the agricultural population is constituted by the outlay for the rearing and educating of the children lost later through migration. It is true that the agricultural population profits indirectly from part of this expense, since a certain number of the migrants place their knowledge at the service of agriculture. This must not be forgotten when considering the figures given below, from which an idea may be obtained of the amount of this outlay. Thus O. E. Baker estimates the outlay for rearing and educating, lost by the farmers of the United States from 1920 to 1929 through migration and from which the non-agricultural population profited, at about 14 milliards of dollars (amounting to between 2,000 and 2,500 dollars per person, assuming that the surplus of persons leaving the farms over those arriving was 6.3 million). Baker adds that this sum is equal to the total value of the wheat crops plus half that of the cotton crops during these years [1]. A similar calculation has been made for Germany by H. Backe. According to this author the number of migrants from agriculture in Germany, between 1935 and 1939, was 1.5 million in round figures and, estimating the outlay per person at 7.000 RM., the total amount for rearing and educating expenses lost by migration reached 10.5 milliards RM [2].

The consequences for national economy.

As economic, social and demographic conditions differ very widely in the various countries, the judgment of migration from agriculture must also differ from one country to another, the more so because the fundamental ideas concern-

(1) BAKER, O. E.: Rural and Urban Distribution of the Population in the United States. In: *The Annals of the American Academy of Political and Social Science*, November, 1936, Philadelphia.

(2) BACKE, H. Um die Nahrungsfreiheit Europas. Leipzig, 1942.

ing the most suitable and desirable economic and social structure of agriculture and of national economy in general, are all entirely different. In order to make a satisfactory study of the effects on national economy, therefore, each country should be discussed separately, or typical instances should be cited. Such a comparison cannot, however, be made in this study, although it would certainly bear witness to the great complexity of the problem. In this connection, too, we must confine ourselves to a few indications.

In this respect, particular importance attaches, in the first instance, to the place towards which the migrants go. If, owing to a shortage of labour opportunities within the country, migration is directed abroad, very productive labour is lost to the national economy. On the other hand, this loss may be compensated by a diminution of the pressure of population, by a widening of the elbow-room for those remaining in the country. Often, too, the ties binding the emigrants to their native country are not completely broken, and their work profits it either directly, in the form of remittances, or indirectly, by helping to establish economic relations. This is particularly true when migration is directed towards the country's own colonies. There is still possibility, however, that the emigrants may be engaged in other parts of the world in increasing agricultural production thus creating still greater competition for the marketing of the agricultural production of their own country.

If the migration takes place within the country itself, pressure may be exercised upon the wage rates in the regions towards which the stream is directed. As a rule, however, the influence exercised on wages by the influx of new energies remains behind that of other factors. This is because migrants from agriculture do not leave the land without reason, as migration increases when a considerable shortage of labour is felt in the other branches of production.

Since the migration from agriculture towards non-agricultural occupations represents, in most cases, as has already been said, an improvement in the economic situation of the migrants and since, on the other hand, in most cases, the situation of those remaining behind improves or at least, does not become worse, migration generally brings about an *increase in the national income.* This fact is confirmed, among other things, by experience, which proves that periods of considerable internal migration are also always periods of increasing economic prosperity.

Migration from agriculture may, moreover, be of the greatest importance for the *distribution of the national income.* The problem so often discussed during the past few years of the low remuneration of agricultural labour, or, in other words, of the smallness of the agricultural population's share in the national income, cannot be solved without an increase in the average productivity of agricultural labour. In many cases, however, this increase is only possible if greater opportunities of work are offered to each individual, and if, therefore, some of the agricultural labourers are replaced by rationalization and mechanization.

The task of agriculture within the nation's economy lies in the *production of foodstuffs and raw materials,* either for home consumption or for export In

countries with a surplus, as well as in those with a deficit, migration may hinder the accomplishment of this task. Nevertheless, the importance of the repercussions in these two cases differs very widely.

In a country with a surplus of agricultural production it may be desirable that, as a result of migration, a further increase in production should be prevented, or that the existing production should be reduced. No doubts can be entertained in this connection by anyone who has witnessed for years the official measures adopted for the purpose of limiting the areas under cultivation and even the efforts made by governments to organize the destruction of surpluses and stocks. A wholesale reduction in the use of labour or an abandonment of land offering a poor return might restore profitableness and, consequently, the capacity for competition with other exporting countries. What, besides, was formerly the advantage of increased production, if there was only a small margin between the return and the outlay of the farm, or if the latter was even greater than the former ? What is really essential, however, is to know what happened to the persons who have been set free. If they can be engaged in other branches of economy, as for instance, for the further development of industry, the economic advantage for the national economy as a whole is evident.

In the great industrial countries the situation has developed quite differently. As has been seen, the competition coming from the world market compelled agriculture to use less labour. Wherever this competition operated unhindered during a long period of years, as in Great Britain, the possibilities of agricultural production became increasingly limited and no room remained for an increase in the agricultural population, which soon began to decline and was eventually reduced to a mere fraction of the total population.

In other industrial countries, the evolution was entirely different, not only because the state of industrialization and the fundamental conditions for their participation in the international division of labour were different, but also because it was found that should evolution be absolutely untrammelled, there would be too great a risk to national economy and that, for this reason, it was better to protect the country's agriculture from foreign competition by adopting suitable trade policies or other measures.

In these cases, one of principal the reasons for the protection of agriculture lay in the wish to avoid an excessive increase in the dependence on foreign countries for agricultural products. Of course, the factors which caused an excessive dependence on foreign countries to appear undesirable, were not exclusively economic; there were also political reasons, and these were most frequently given first place. It should never be forgotten, however, that this is also a question of an eminently economic character.

When a country depends to a great extent on another for its supplies of foodstuffs, there is —except in a few very special cases—a notable lack of stability and security in the national economy. A satisfactory and regular supply system not only presupposes that the marketing of industrial products is assured, but that the world market in its turn is always in a position to supply a suffi-

cient quantity of agricultural products at reasonable prices. Not very long ago, people were inclined to take these matters very lightly, but now that the evolution may be viewed more clearly, many doubts formerly expressed assume increasing importance, and in most industrial countries, prospects for world economy as regards the exchange of industrial for agricultural products are considered to be much less favourable than formerly; not only because the development of industry in the old industrial countries, the appearance on the scene of new industrial countries and the intensification of industrialization in agricultural countries have been to an enormous extent increasing competition for the sale on the world market of industrial products, but also because conditions of agricultural production in the agricultural countries have undergone radical changes.

The strongest argument used against the protection of agriculture in industrial countries was often that of the increased cost of living. In the interest of marketing industrial products, stress was laid on the need for keeping the cost of supplies for the working masses as low as possible. It was frankly admitted that the agricultural exporting countries were in the best position to meet this requirement. Everyone was convinced of their superiority, but it was not sufficiently understood how low costs of production were obtained and above all whether they were a passing phenomenon or whether they could be maintained. We shall have a few words to say here on this subject as well. From the start, we shall exclude from consideration the supplies which could only keep their place on the world market because wages and the standard of living were low at the point of production. It goes without saying that the progressive countries sought to protect their agriculture against this type of supply and there is no need to go into the reasons for this in detail.

The opening up of new agricultural regions for the world market during the past century was accompanied almost everywhere, as has already been said, by methods of cultivation which exhausted the soil and, very frequently, even destroyed its fertility. For many years no thought was given either to preserving or to increasing the fertility of the soil. The consequence of this practice has, in vast regions, been the impoverishment and destruction of the soil. If these losses of productivity of the soil, as found today in North and South America, Africa and Australia, were to be considered as forming part of the costs of production, the much-vaunted superiority of the new agricultural regions, including those in the Tropics, would appear much less impressive.

This type of agricultural expansion has been more or less abandoned in our time. It is true, nevertheless, that many regions capable of cultivation are still far from being exploited, but these areas are small when compared to those which have been opened up to the world market since the middle of the last century. The exploitation of these regions would, moreover, be of a much less speculative character.

At the same time, the farming methods used during the period of expansion are being gradually abandoned in almost all the great exporting agricultural regions which were brought into touch with the world market during the last century. The development of agriculture in vast regions is being increasingly brought

into the same paths as those followed in the past by the countries of old civilization. The intensity of farming increases but slowly, it is true, but the advance is steady. In many places intensive forms of mixed farming are already in use. Everywhere the social ties have also been tightened and strengthened; costs represented by wages, taxes, social charges and contributions are increasing; in a word, production costs are constantly rising. Most of the possibilities for making up for this increase in production costs by means of the development of the mechanization of production and of the rationalization of the marketing system have already been exhausted; any further progress in this direction cannot but be very slow. A comparison of the costs of agricultural production in the countries mentioned above and in those of the Old World would most probably show that the differences between the costs of production are as a rule overestimated and that in the case of many products, there can no longer be any question of such disparity. Unfortunately, such a comparison, which would be subject, even in normal times, to considerable qualifications, is quite impossible today owing to the great influence exercised by the State on production, marketing, prices and exports.

Another argument often advanced against the protection of agriculture was that it retards agricultural progress. But the actual development has proved this assertion to be false. Agriculture in the countries in question has not remained inactive behind the customs barriers, as shown by the progress made by it in every sense and by the continuous increase in productivity. Above all, it has not only succeeded in preserving the fertility of the soil, but even in increasing it.

Looking at the evolution from this standpoint, customs barriers and the encouragement of agriculture in many European countries, as introduced during the last decades of the past century, were absolutely justified from the standpoint of national economy. Not only did they guarantee an increase in agricultural production, but they also helped to check the tendency to abandon agriculture. In the absence of such measures it would not have been possible to maintain the numbers of agricultural population at so high a level, nor yet to ensure it such satisfactory conditions from the social and economic standpoints. In spite of this protection, however, a decline in the agricultural population, first relative and then even absolute, could not be avoided. If the natural increase in population, which was considerable almost everywhere, was to remain for the most part or even entirely in the country, this would only be possible, according to the general opinion, if no obstacles were placed in the way of the development of industrial activity. This was what checked the development of agricultural protectionism. Too great an increase in the price of agricultural products above the level of world market prices, was considered injurious in so far as it restricted the competitive capacity of industrial exports. Continued exportation of industrial products was, besides, only considered possible on condition that agricultural products were imported. Everyone was sure that, in the economic interests of the community as a whole, one had to become reconciled even to an excessive migration from the land.

If in these countries and in others, the continued migration from agriculture never ceased to cause anxiety, and was always considered as a great evil, this was less for economic than for non-economic reasons, national, politico-social and demographic. Nevertheless, as the considerations expounded above have clearly shown, a sharp division between these different points of view cannot be made, since they are closely interwoven. Thus, the ambition to attain the greatest possible independence as regards supplies of agricultural products rarely originated in considerations of a purely economic character, but was most often based also on national grounds connected with foreign policy and national defence.

What distinguishes the modern view of the phenomenon of migration from agriculture from the opinions held on the subject in the past, lies chiefly in the importance now attributed to demographic considerations. It will readily be understood that this is due to the complete change which has taken place in the demographic conditions of migration. The time when the increase in the population hardly knew any limits in almost every progressive country came to an end during the past twenty years. In some countries as a general phenomenon, and in others as a phenomenon confined mainly to urban centres, the number of births fell to such a low level that, according to forecasts, it no longer guarantees even the maintenance of the present numbers of the population. Under these circumstances, more than ever does one see in a healthy and numerically strong agricultural population, the best guarantee for the continuance of the people and the State. It is comprehensible that the movement is followed with the greatest attention in every country where migration from agriculture has already affected the numbers of the agricultural population. Anxiety is particularly strong in those countries where the process of industrialization of the economy and of the population is most rapid, where the percentage of the urban population and especially of the population in the great cities has increased to the greatest extent, and, above all, where the decline in the birth-rate has also became widespread among the agricultural population.

Serious anxiety in this connection is felt not only in the countries belonging to the Old World, but also in those of the New World. The following considerations taken from a report on land planning drawn up in the United States by various federal authorities for the Land Planning Committee of the National Resources Board are very characteristic in this connection. The report states: " Practically half the farms in the nation produced less than $ 1,000 worth of products in 1929, a fairly prosperous year, and over a fourth of the farms produced less than $ 600. These figures include the value of the products from the farm consumed by the family. If only the value of products " sold or traded ", to use the Census phrase, be included, those farms that produced less than $ 600 worth of products — 28 per cent. of all the farms in the nation — contributed only 3 or 4 per cent. to the nation's commercial production of farm products; and the farms that produced less than $ 1,000 worth of products, 49 per cent. of all the farms in the nation (including those that produced under $ 600), contributed only about 11 per cent. of the commercial production. Undoubtedly the most productive half of the farmers of the nation, those who contributed 89 per cent. of the commercial production in 1929, could within a few years provide the other 11 per cent. of

the commercial production if prices of farm products encouraged them to do so. From the standpoint of commercial production nearly half the farmers of the nation are not needed. But it is these farmers, pursuing a largely " subsistence " system of farming, who are producing more then their proportion of the children that, prior to the depression, migrated to the cities; and in the future children will be even more valuable than in the past. From the economic standpoint fewer farmers, apparently, are needed. But from the social standpoint, and from the standpoint of national welfare (assuming the harmful consequences of a declining population) more farmers are needed, or at least more families that have that stability and strength which is associated with living on the land " (1). In order the better to understand these considerations, it should be added that in the United States, today, the number of children in the country's average is 5 per cent. and even in the cities it is 25 to 30 per cent. below the figure required to maintain the population permanently without accessions from outside; the farm population on the contrary, has still a surplus of 50 per cent (2).

The passage of the report quoted above also shows how deep is the abyss which divides the ambition — equally desirable from the point of view of both private and national economy — to attain the maximum productivity of labour from the social requirements of an agricultural population numerically strong and healthy in every respect. In may other cases, the contrast between purely economic requirements and the needs of national policy may not be less marked.

The first condition for gaining clear insight into the character and importance of the various factors in order to find a solution to the problem, is to make a careful and impartial study of the actual situation. In this respect, valuable work has undoubtedly been done in many countries during the past twenty years or so, as may be seen from the numerous investigations carried out on a large scale and embodying the contributions of agricultural economists, sociologists and specialists in demography who have all displayed a keen interest in the subject. What characterizes these investigations in the first place is that the withdrawal from agriculture to other occupations is no longer considered as an isolated phenomenon, but as a fact belonging to the whole process of demographic and economic evolution.

In various countries attention to the problem did not stop at the investigation, conclusions and the resulting suggestions. In these countries it is no longer intended that evolution should follow its own course as previously. Many measures have indeed been adopted, with the well-defined purpose of combining them in a carefully planned programme with a threefold object: to increase the return on agricultural labour, to maintain a numerically strong but, above

(1) General Conditions and Tendencies influencing the Nation's Land Requirements. Part. I of the Supplementary Report of the Land Planning Committee to the National Resources Board, Section I.: "The Outlook for Population ". Washington, 1938.

(2) See: Baker, O. E. and Taeuber, C.: The rural people. In: Farmers in a changing World. Yearbook of Agriculture, 1940. Washington.

all, a healthy agricultural population and to reduce the too pronounced difference existing between working and living conditions in the town and in the country.

Now as before, it is intended that every attempt should be made by every possible means, to increase the productive efficiency of agriculture and especially of agricultural labour. While doing this, the resources of modern technique should be utilized to a much greater extent than formerly to reduce the discomforts and the duration of agricultural work.

By means of an adequate control of production and marketing, it is hoped to arrange that workers engaged in production will be able to profit to a greater extent than heretofore from technical progress and to prevent these advantages being enjoyed in the first place or exclusively by consumers, as has been the case almost everywhere up to the present. Technical progress should not concentrate upon the single objective of increasing production, but must contribute to the same extent towards guaranteeing to the agricultural population a healthy existence from the social and biological point of view. An increase in ouptut is no longer considered as desirable when the immaterial disadvantages are greater than the material advantages resulting therefrom.

The time is also past when it was thought that it was necessary to maintain the agricultural population at a certain level. Everyone knows that this would be incompatible with economic progress. Indeed, it is not only a question of quantity, but also of quality. Now, as regards quality, it is believed that the best conditions for ensuring the quality of the rural population are to be found in regions where peasant agriculture predominates. The experience of centuries has proved that this form of agriculture is most successful not only from the demographic standpoint, but also from the social and — in the long run — even from the economic standpoint. It is often objected, however, that modern technical methods for the cultivation of the soil and, above all, the progress made in the technical application of agricultural machinery, guarantee considerable and more lasting advantages to large farms than to the peasant farm. Undoubtedly, the gulf which separated the large farms from those operated by peasants, especially from the point of view of the use of agricultural machinery, had often caused anxiety during the past decades; considering, however, the totality of the farms, this difference is found to be much smaller than was thought, especially by persons who were not in close touch with agriculture, and this for the simple reason that there is much diversity between the orientation of production on the great majority of the highly mechanized large farms (occupied chiefly or exclusively in arable farming) and that on the peasant farms) mixed farms with numerous livestock). Moreover, during the past years, the technique of construction of agricultural machinery has reached a point where in many branches it meets the requirements of peasant farms in the same degree as those of the large farms. During the ten years prior to the present war, this development proceeded at a steadily increasing pace from one year to another. Lastly, it may be objected that any technical superiority resulting from the use of machinery on the large farms is of slight importance when it is recalled that the peasant farm is better able to stand up against periods of depression and gives an equal, if not a higher, return per unit of area, while at the same time it provides to many people more

satisfying economic and moral conditions than those possible on a large farm. It may be assumed that such satisfaction in itself can largely compensate for a lower productivity of labour.

It is another matter, however, to know whether the demographic consequences of a special protection of agriculture and of a particular encouragement of peasant farming do actually justify expectations. One has the impression that this may not be the case at least in those industrial countries where the proportion of the agricultural population, as well as of the total rural population, has declined and altered so much during the last decades that, in the long run, it will no longer be able to make good, in the same degree as formerly, the great wastage of man-power caused by the modern forms of economic activity tending towards an ever-increasing mechanization, rationalization and concentration. However much the importance of a strong agricultural population may increase even under these circumstances, it is none the less important to obtain more natural and healthier conditions for the great mass of the urban population, especially for the inhabitants of the large cities, than those under which they are at present compelled to live.

NEW PERIODICALS RECEIVED BY THE LIBRARY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE

for the third quarter of 1942 (*)

BALGARSKO zemedelsko droujestvo, Sofia. Архивъ на българското земедѣлско дружество. Животновъдство. София, v. 1 (1941)—, irr. [Headings and summaries also in German. Title also in German: Archiv der Bulgarischen landwirtschaftlichen Gesellschaft. Tierzucht.]

BALGARSKO zemedelsko droujestvo, Sofia Архивъ на българското земедѣлско дружество. Земедѣлие. София, v. 1 (1942)—, irr. [Headings and summaries also in German. Title also in German: Archiv der Bulgarischen landwirtschaftlichen Gesellschaft. Pflanzenbau.]

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(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice monthly); bimestr. (every two months); déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular); mens. (monthly); nº. (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

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Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

STABILIMENTI TIPOGRAFICI CARLO COLOMBO — ROMA, 5 FEBBRAIO 1943.

AGRICULTURAL STATISTICS

MONTHLY CROP REPORT
AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country : Germany, Bohemia and Moravia (Protectorate); Hungary : 1 = excellent, 2 = good, 3 = average, 4 = poor, 5 = very poor; Finland : 8 = very good, 6 = above the average, 5 = average; France : 100 = excellent, 70 = good, 60 = fairly good, 50 = average, 30 = poor; Romania and Sweden : 5 = excellent, 4 = good, 3 = average, 2 = poor, 1 = very poor; Netherlands : 90 = excellent, 70 = good, 60 = fairly good, 50 = below average; Portugal : 100 = excellent, 80 = good, 60 = average, 40 = poor, 20 = very poor; Switzerland : 100 = excellent, 90 = very good, 75 = good, 60 = fairly good, 50 = average, 40 = rather poor, 30 = poor, 10 = very poor; U. S. S. R. : 5 = good, 4 = above the average, 3 = average, 2 = below average, 1 = poor; Canada : 100 = crop condition promising a yield equivalent to the average yield of a long series of years; United States : 100 = crop condition which promises a normal yield; Egypt : 100 = crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed : 100 = crop condition which promises a yield equal to the average of the last ten years.

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

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PRODUCTION AND CONSUMPTION OF AGRICULTURAL COMMODITIES AND RAW MATERIALS

The International Institute of Agriculture has recently published a study in which, on the basis of available statistics for the five years preceding the present war, an attempt has been made to give a synthesis of agricultural production and of the consumption of agricultural products in the whole world and in its different parts.

The following paper is a summary of that study, prepared by Valentino Dore, Chief of the Statistical Bureau of the Institute.

Introduction.

If one considers the present stage of international agricultural statistics as compared with only a few decades ago, one must admit that the progress made in this field is very important. It is possible today, for a number of fundamental products, to register rather complete totals of world production and to know approximately in what measure the different countries and continents contribute to it.

We must not think, however, that all available data are entirely satisfactory and represent completely the real state of affairs. If in certain countries statistical methods have been so well perfected and improved as to allow of reaching ever more reliable results, elsewhere available figures are merely approximate estimates which imply the possibility of a large margin of errors. Moreover, there are still some gaps. The number and importance of territories ignoring agricultural statistics have been reduced, no doubt, but there are still some regions where all numerical information relative to agricultural production is utterly lacking.

Lastly, not all branches of agricultural statistics are equally developped, so that, for some products, information may be much more complete and secure than for others. This different development is partly explained by the greater interest that some products have in national economies and in international exchanges, and partly by the technical difficulties in getting certain data. Broadly speaking, for instance, statistics of animal products are less complete than those of the production of the land, vegetables and fruit statistics are much more imperfect than those of the products of the fields, and the statistics of products of tropical countries are much less satisfactory than those of temperate regions.

In spite of all, however, the mass of statistical information on the production of an important number of agricultural commodities and raw materials, although still uncomplete and imperfect, is abundant enough to justify an effort to arrive at a calculation of world agricultural production and of its distribution among the different parts of the world.

This effort has been made by the International Institute of Agriculture in a publication (1), just recently issued, whose scope is not limited to determining the distribution of world agricultural production by continents, but also to establishing, on the basis of data on production and international trade, the distribution by continents of the consumption of agricultural commodities and raw materials. It has thus been possible, as a final conclusion, to set up a balance between production and consumption and to establish the proportion in which the total amounts produced in each part of the world show a surplus or a deficit as compared with amounts consumed.

As stated in the Introduction to the volume, this work aims only at being a first attempt in an extremely complex domain and on the basis of a statistical documentation which is defective and uncomplete under a number of aspects. It " must be considered as a modest point of departure for furher studies, destined to be bettered and completed through the progressive improvement of agricultural statistics in the different countries and thanks to criticism and suggestions of experts that are willing to assist us in this task ".

The conclusions that may be drawn from this study, are therefore to be accepted with a certain caution. They seem however to be of such a nature as to give a general, largely approximate, orientation on problems of a particular interest in the present moment. This is the reason which has led us to briefly summarize, in this article, the chief results of the study in question.

As regards the sources utilised, the methods followed in the calculations of total production and consumption, the reservations on the character of broad approximation of results obtained, the reader's attention is called on the detailed information contained in the volume itself. We limit ourselves to mention here that the products surveyed are 34 (2). These products, to which total fi-

(1) *Denrées et matières premières agricoles. Production et consommation dans les différentes parties du monde:* 1931-38. Rome, 1942. Price: 25 lire.

(2) Wheat, rye, barley, oats, maize, rice, potatoes, sugar, coffee, tea, cocoa, wine, tobacco, cotton, flax, hemp, jute, Manila hemp, sisal and other similar textile agaves, rubber, linseed, cotton seed, soya, groundnuts, coprah, palm kernels, olive oil, palm oil, beef and veal meat, lamb and mutton and goat-meat, pork meat, milk, wool, silk.

gures are referring, do not naturally cover the whole of world production and consumption of agricultural commodities and raw materials, even though they are a considerable part of it. If more complete figures were available, conclusion might be somewhat different. As statistics of temperate countries and of their products are generally more complete and correct than those of tropical regions, there are good reasons to believe that the level of production and consumption of some continents, notably Asia and Africa, appears slightly lower than it really is.

All the figures employed as basis for the the calculations, represent averages for the years 1934-1938.

Distribution of production among the different continents.

The first question which our study has attempted to clear is the following: in what proportion do the different parts of the world contribute to the total production of the whole world ?

The elaboration of all available data for the products surveyed, gave the following results:

Per cent. as compared with world production

Europe	29.6
Asia	27.4
North America	15.9
U. S. S. R.	11.9
Central and South America	8.8
Africa	3.6
Oceania	2.8
Total	100.0

Nearly 6/10 of total production appear as furnished by Asia and Europe which contribute to it in very similar proportions. Then follow, by order of importance, North America, whose production amounts to little more than one half of that of Europe, the U. S. S. R., with 3/4 of that of North America, Central and South America, with nearly 3/4 of the production of the U. S. S. R. Africa and Oceania contribute to world production in very modest proportions.

It is interesting to see the relation between the distribution by continents of world agricultural production and territorial area and population.

Although Europe, as to area, is the smallest continent, yet it furnishes the highest proportion of agricultural production; Africa, which is the largest continent, contributes to world agricultural production in a comparatively very small measure. On an area which gives 100 production in Europe, only 19 is obtained in Asia, 15 in North America, 10 in the U. S. S. R., 8 in Central and South America, 6 in Oceania and 2 in Africa. These differences are evidently to be attributed mostly to the very different proportions (according to continents), of agricultural land; but it must not be overlooked that a good share is to be attributed also to the more or less great fertility of agricultural land and to the more or less intensive character of agriculture.

Per cent. as compared with world total

Continents	Agricultural production	Territorial area	Population
Europe	29.6	4.1	18.6
Asia	27.4	15.9	53.3
North America	15.9	14.8	6.6
U. S. S. R.	11.9	16.0	7.8
Central and South America	8.8	20.3	6.0
Africa	3.6	22.5	7.2
Oceania	2.8	6.4	0.5
Total	100.0	100.0	100.0

As regards the relations between agricultural production and population, if we take at 100 the quantity produced by each inhabitant in Europe, we find that the production per inhabitant in North America is 152, and 355 in Oceania, while it is 95 in the U. S. S. R., 92 in Central and South America, 32 in Asia and 31 in Africa.

Proportion between production and consumption in the different continents.

From the point of view of the relative importance of their consumption as compared with that of the world, the different continents are placed in the same order as they occupy on the basis of their relative importance as producers. The proportions of production and consumption, however, show some important differences.

Per cent. as compared with world totals

Continents	Agricultural production	Consumption of agricultural products
Europe	29.6	36.8
Asia	27.4	25.3
North América	15.9	16.0
U. S. S. R.	11.9	11.9
Central and South America	8.8	6.7
Africa	3.6	2.3
Oceania	2.8	1.0
Total	100.0	100.0

Consumption in Europe takes decidedly first place, it being almost 50 per cent greater than that of Asia, while the respective production of these two continents does not considerably differ.

The proportions between consumption of the U. S. S. R. and North America and total consumption, correspond exactly, or nearly so, to those of their respective productions as compared with the total.

Central and South America, Asia, Africa and Oceania contribute to total consumption in a lesser proportion than they do in world production.

The different situations define the predominant character of Europe as an importing continent of agricultural products, as they define the character of exporters of Central and South America, Asia, Africa and Oceania, while North America and the U. S. S. R. figure as continents where production and consumption show a tendency to balance.

As a matter of fact, Europe produces only about 4/5 (80,5 per cent.) of the agricultural products that it needs for its own consumption. Asia, Central and South America only consume respectively, 92.0, 76.5, 65.8 and 36.6 per cent of their production. In the U. S. S. R. and in North America, total production and total consumption are nearly balanced: the former registers a surplus and the latter a deficit of less than 1 per cent.

Production and consumption of commodities of vegetal and animal origin.

The proportion respectively of commodities of vegetal and of animal origin in the production and consumption of the different continents and of the world, is shown in the following table:

Per cent. as compared with total production and consumption of each continent and of the world.

CONTINENTS	Production of products of		Consumption of products of	
	vegetal origin	animal origin	vegetal origin	animal origin
Europe	44.6	55.4	49.8	50.2
Asia	71.2	28.8	69.2	30.8
North America	40.8	59.2	39.5	60.5
U. S. S. R.	69.2	30.8	69.1	30.9
Central and South America	40.9	59.1	30.5	69.5
Africa	56.7	43.3	40.5	59.5
Oceania	20.5	79.5	28.9	71.1
Whole world	53.7	46.3	53.7	46.3

The proportion of vegetal production varies from a minimum of about 1/5 in Oceania to a maximum of over 2/3 in Asia, while for the whole of the world, the importance of vegetal production is about 16 per cent higher than that of animal production.

In Europe, the consumption is about the same for both vegetal and animal products, although the importance of production is higher for animal products.

In Africa, the consumption of animal products is comparatively higher than that of products of vegetal origin, while the latter's production is bigger than the former's.

In all other parts of the world, except Oceania, the proportion of consumption of animal products to total consumption is higher than their animal production as compared with the total agricultural output.

The differences between the relative importance of vegetal and animal products, respectively in the production and in the consumption of the different parts of the world, depend on the fact that commodities of vegetal origin represent the most important part (about 3/4) of the international trade in agricultural commodities, with the result that, in a general way, the importance of the consumption of vegetal products is lower than that of their production in exporting continents and higher in Europe, which is an importer.

Considering the proportion of the contribution of each part of the world to total production and consumption of respectively vegetal and animal products, the following results are obtained:

Per cent. as compared with world totals

CONTINENTS	Production of products of		Consumption of products of	
	vegetal origin	animal origin	vegetal origin	animal origin
Europe	24.6	35.5	34.2	39.8
Asia	36.4	17.0	32.6	16.8
North America	12.1	20.3	11.8	20.9
U. S. S. R.	15.4	7.9	15.3	7.9
Central and South America	6.7	11.3	3.8	10.1
Africa	3.8	3.3	1.8	3.0
Oceania	1.0	4.7	0.5	1.5
Total	100.0	100.0	100.0	100.0

It may be noticed that the importance of the different continents in the production of vegetal and animal commodities of the whole world shows very marked differences, the extremes of which are furnished, on one side, by Asia which yields 36.4 per cent of world vegetal production and only 17 per cent of animal production, and on the other side, by Oceania which contributes 1 per cent of the vegetal and 4.7 per cent of the animal production. In the same way, the differences in the partecipation of the different countries in the consumption of, respectively, animal and vegetal products are, in many cases, very marked.

Europe appears as a continent which registers a deficit both as regards vegetal and animal commodities, but the proportion is considerably higher for the former than for the latter. The production of the continent covers 72.1 per cent of its needs in the case of products of vegetal origin and 89.9 per cent in the case of animal products.

The U. S. S. R., registers a comparatively unimportant surplus (0.6 per cent of production) as regards vegetal products and a weak deficit in the case of products of animal origin which fill 99.4 per cent of the country's consumption.

North America registers a limited surplus (2.8 per cent of production) in the case of vegetal products, but its production covers only 97.2 per cent of its consumption of animal products. The other parts of the world show a production surplus the proportion of which is particularly important in Central and South America and in Africa in the case of vegetal products, while in Oceania the proportion is very important both for vegetal and animal products.

Production surplus in relation to consumption, in per cent.

Continents	Vegetal products	Animal products
Central and South America	43.0	9.9
Asia	10.4	1.4
Africa	53.1	9.5
Oceania	48.6	67.3

Finally, as regards the production and consumption par inhabitant of respectively vegetal and animal products, by considering equal to 100 the figures relative to Europe, we get the following index-numbers for the other continents:

Index-numbers of production and consumption, per capita.

Continents	Production		Consumption	
	Vegetal products	Animal products	Vegetal products	Animal products
Europe	100	100	100	100
U. S. S. R.	148	53	106	47
North America	139	162	97	148
Central and South America	84	98	35	78
Asia	51	17	33	15
Africa	40	24	13	20
Oceania	164	509	61	148

Oceania registers the highest per capita production, and is followed by the U. S. S. R., for the products of vegetal and by North America for those of animal origin. The highest per capita consumptions are registered by Oceania, followed by the U. S. S. R., in the case of vegetal and by North America in that of animal products. The highest per capita consumptions are registered by the U.S.S.R., followed by Europe, for vegetal products and by North America and Oceania, followed by Europe, for products of animal origin. Asia and Africa register the owest per head productions and consumptions for each of the two groups of commodities.

Production and consumption of agricultural commodities distributed according to their destination.

By grouping the products surveyed by three categories, viz, products tor human consumption (including olive oil, but not including the other oleagineous products), oleagineous products (not including olive oil) and products for industry, the following results were obtained in regard to the proportion in which each category respectively contributes to total production and total consumption of the different parts of the world.

Per cent. as compared with total production and consumption of each continent and of the world.

Continents	Production			Consumption		
	Products for human consump-tion	Oleagineous products	Products for industry	Products for human consupm-tion	Oleagineous products	Products for industry
Europe	97.6	0.1	2.3	87.9	2.3	9.8
U. S. S. R.	88.2	1.5	10.3	87.7	1.6	10.7
North America	82.2	2.9	14.9	81.5	3.9	14.6
Central and South America	86.5	3.7	9.8	93.6	1.8	4.6
Asia	81.0	7.2	11.8	85.0	6.0	9.0
Africa	70.4	10.0	19.6	92.8	3.6	3.6
Oceania	71.3	1.1	27.6	92.7	0.8	6.5
Whole world	86.8	3.4	9.8	86.8	3.4	9.8

Products for human consumption represent, in all parts of the world, the most important part of agricultural production, with an average of about 87 per cent of the total, a maximum of nearly 98 per cent in Europe and a minimum of about 70 per cent in Africa. The relative importance of the other two categories is characterised by very big differences between one continent and the other. The share of products for industry, which, for the whole of the world amounts to almost 10 per cent, varies between a minimum of 2.3 per cent in Europe and a maximum of 27.6 per cent in Oceania; the share of oleagineous products (3.4 per cent for the world as a whole), varies between a minimum of 0.1 per cent in Europe and a maximum of 10 per cent in Africa.

In Europe, in the U. S. S. R. and in North America, the relative importance of products consumed directly by man as compared with total consumption, is inferior to the importance of the production of these commodities as compared with total production. In the same continents, on the contrary, oleagineous products and products for industry contribute to total consumption in a far greater measure than to total production. An entirely opposite situation is shown by Central and South America, Asia, Africa and Oceania.

A survey of the proportion in which the different continents share in the production and in the consumption of each of the three categories surveyed, shows the following results:

Per cent. as compared with world totals

Continents	Production			Consumption		
	Products for human consump-tion	Oleagineous products	Products for industry	Products for human consump-tion	Oleagineous products	Products for industry
Europe	33.3	1.1	6.9	37.5	25.2	36.2
U. S. S. R.	12.1	5.4	12.5	12.0	5.5	12.8
North America	15.1	13.8	24.2	15.0	18.5	23.5
Central and South America	8.8	9.6	8.9	7.3	3.5	3.2
Asia	25.5	58.6	32.7	24.8	44.6	22.8
Africa	2.9	10.5	7.1	2.5	2.5	0.8
Oceania	2.3	1.0	7.7	1.1	0.2	0.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

Thus Europe, followed by Asia, is the biggest producer of commodities for human consumption. Asia, by itself alone, produces more than one half of the total amount of oleagineous products, and Asia again, followed by North America, is the biggest contributor to the production of raw materials for industrial purposes.

Europe, Asia and North America absorb over 3/4 of total consumption for each of the three groups. Europe holds first place in the consumption of products destined to human alimentation, and to industrial purposes: it holds second place in the consumption of oleagineous products. Asia is at the top of the other continents as a consumer of oleagineous products, and holds second place for products destined to human alimentation and third place in the case of products for industry. North America occupies second position as a consumer of products destined to industry, and third position in the consumption of alimentary products for human beings and also as regards oleagineous products. Fourth place for each of the three groups is occupied by the U. S. S. R. The share of the other continents is comparatively very modest.

In short, Europe is very largely dependent on the other continents for its supply of oleagineous and products for industry: its production, in fact, covers only 4.4 and 18.7 per cent, respectively, of its consumption of these commodities. Its dependence is comparatively much less acute in the matter of products for human consumption, which are provided by the agriculture of Europe itself in the proportion of about 9/10.

Production in North America, registers a considerable deficit, corresponding to about 1/4 of the consumption of this continent, as regards oleagineous products, and a small surplus both as regards commodities destined to human alimentation (0.2 per cent) and raw materials for industrial purposes (1.8 per cent). The production of the U. S. S. R. shows a comparatively small deficit (3.7 per cent of consumption) as regards raw materials, and a slight surplus (0.8 per cent of production) as regards products for human consumption.

Central and South America, Asia, Africa and Oceania show a production surplus for each one of the three categories of products surveyed. The relative importance of this surplus is especially important, for all categories, in the case of Oceania and for oleagineous and products for industry in the case of Central and South America and of Africa.

Production surplus in relation to consumption, in per cent.

CONTINENTS	Products for human consumption	Oleagineous products	Products for industry
Central and South America	17.1	63.4	64.1
Asia	3.2	24.1	29.3
Africa	13.2	76.3	88.1
Oceania	52.5	74.2	91.3

Lastly, as regards production and consumption per inhabitant, respectively in products for human consumption, oleagineous products and products for in-

dustry, by considering equal to 100 the figures relative to Europe, we find, for the other continents, the following index-numbers:

Index-numbers of production and consumption, per capita.

Continents	Production			Consumption		
	Products for human consumption	Oleagineous products	Products for industry	Products for human consumption	Oleagineous products	Products for industry
Europe	100	100	100	100	100	100
U. S. S. R.	86	1,170	431	76	51	84
North America	128	3,560	994	114	208	183
Central and South America	81	2,690	398	60	43	27
Asia	27	1,860	166	23	62	22
Africa	22	2,480	268	17	26	6
Oceania	259	3,010	4,313	110	34	71

Oceania registers the highest per capita production for commodities destined to human consumption and for raw materials destined to industrial purposes; North America occupies first place in the matter of oleagineous products; the lowest per capita production figures are registered by Africa in the matter of products destined to human consumption, and by Europe in the matter of oleagineous products and products for industry.

As regards per capita consumption, North America holds first place for each of the three categories, and is immediately followed by Oceania and Europe for the products destined to human consumption, and by Europe for oleagineous products and products for industry; Africa and Asia show the lowest per capita consumption level both for products destined to human consumption and for products for industry.

Some details on the relation between production and consumption of the different commodities in each continent.

A detailed study of distribution, among the different continents, of production and consumption of each one of the commodities surveyed, would carry us beyond the limits of this article in which we have had in mind only to summarise the most general conclusions of a publication in which, if needs be, the reader will be able to find the complementary information that he may desire.

Here too, we will limit ourselves to a few more important remarks.

The details on the distribution of production, among the different continents, of the different agricultural food commodities and raw materials show the great measure in which some of them are concentrated within certain parts of the world.

Asia produces the whole of jute and Manila hemp, 9/10 or more of tea, rubber, rice, silk, soya, and more than 8/10 of coprah, Africa more than 9/10 of palma-

kernels and 2/3 of cocoa, Central and South America nearly 9/10 of coffee, Europe more than 4/5 of olive oil, over 3/4 of wine and about 2/3 of potatoes.

Other products, on the contrary, are more widely distributed. All parts all the world, for instance, contribute (in different proportions, it is true) to the production of wheat, sugar, wool, meat and milk.

Consumption is generally much more widely distributed among the different continents, in consequence of the exchanges of commodities between the parts of the world that show a surplus production and those that register a deficit.

In Europe, consumption is above production in the case of all commodities surveyed except potatoes and olive oil, for which it registers a small production surplus. The whole of several tropical products and nearly the whole of the amounts of cotton and groundnuts needed for its consumption, come to Europe from other continents. Moreover, as a complement to its production, Europe must import more than 85 per cent of its consumption of linseed and cotton, over 2/3 of wool, about 60 per cent of rice and silk, half of tobacco, over one fourth of maize, sugar, mutton and goat meat, about 1/6 of wheat. As regards the other commodities surveyed, European production covers more than 9/10 of the consumption of the continent.

The U. S. S. R. shows a comparatively small surplus of production for all cereals except rice, for tobacco, hemp and milk, and a somewhat more considerable surplus for flax and sugar, but besides some tropical products that are not grown over its territory, it must import almost 3/4 of the tea it consumes, nearly 1/3 of wool, 1/6 of rice, 1/8 of soja and a comparatively small amount of cotton.

North America shows a comparatively important surplus in the production of cotton, tobacco, wheat and rice, and a somewhat weaker surplus for barley, meat, soya, pork, and milk. Otherwise, the consumption requirements of this continent are entirely covered by the importation of a number of commodities and raw materials that are not produced in the continent itself. Moreover, North America must import almost 3/4 of the sugar that it consumes, 2/3 of linseed, 1/3 of wool and a comparatively small proportion of some other products.

Central and South America produce much more than they consume of most of the commodities and raw materials surveyed. The share of production available for exportation is above 4/5 for cocoa, sisal etc., linseed and wool, about 2/3 for sugar, coffee and hemp, one half or thereabout, for cotton, barley and oats, above 1/3 for maize, and is respectively somewhat higher and somewhat lower than 1/4 for tobacco and rubber, while it amounts to about 1/5 for wheat and 1/10 for beef meat.

Africa and Asia also register a surplus production for nearly all commodities and raw materials surveyed. The proportional share of production available for exportation is particulary high in Africa for cocoa, wool, wine, olive oil, coffee, in Asia for rubber, sisal, Manila hemp, silk, linseed, jute, coffee, tea.

Finally, Oceania consumes much less wool, milk, meat, sugar, wheat, barley and coffee than it produces.

VEGETAL PRODUCTION

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE BARLEY AND OATS.

Bulgaria: According to unofficial information, a retrospective survey of the condition of cereal crops this year, may be summarized as follows: A very cold Winter and a rainy and rather cold beginning of Spring were not favourable to vegetation of winter cereals and to sowings of spring cereals. The drought in the months of April and May retarded the development of winter cereals and the vegetation of spring cereals. But very good weather at the end of May and of nearly the whole month of June, improved considerably the condition of the crops and particularly of spring cereals. The condition of winter cereals has become satisfactory.

Denmark: On August 1, 1942 crop condition of cereals (according to the system of the Institute), was as follows:

Crops	August 1, 1942	July 1, 1942	August 1, 1941
Wheat	78	75	75
Rye	91	87	83
Barley	101	98	82
Oats	97	95	79
Meslin	98	96	79

The crop conditions on August 1 is appreciably better than that on July 1. In the Islands, the crop condition is generally better than in Jutland.

In many agricultural districts of Denmark, the wheat crop was dammaged somewhat by hail.

It was presumed that harvesting of cereal crops would set in by the middle of August in the Islands and in the eastern regions of Jutland, but, somewhat later in the other parts of Jutland. Since the barley was laid for the greatest part, harvesting will probably be somewhat difficult. The crop suffered somewhat from rain by the end of July, and early in August warm weather and sunshine was needed for the formation of the kernels.

Spain: At the beginning of June barley harvesting, followed by harvesting of the other cereals, was started nearly everywhere. According to the first information, barley yields are above those of 1941, but remain below forecasts. Forecasts for wheat and oats are good.

According to press information at the end of July, the harvest of cereals which has reached its highest point all over the country except a few regions, has not been as good as had been forecast, owing to drought at the beginning of summer. For the same reason, the barley crop has been only average. Wheat yields, on the contrary, have been higher, so that wheat production is expected to be above average. Harvest is not entirely over yet.

Finland: During the second part of June, cold weather predominated and at night there were frosts which caused some damages. In the western and southwestern regions, rainfall was above normal, and in the other regions it was under average. No malady of the plants has been reported, and damages caused by plant pests are no more serious than were last year. Except for winter wheat, it is generally forecast that yields will be bigger than in 1941.

The crops are retarded by cause of excessive rainfalls and too low temperatures. Production is expected, however, to be superior than last year's exception made for winter wheat and rye. In regard to these two cereals, seedings had been effected already late and later on crops suffered seriously by rain and hail. On August 1, the crop condition (according to the system of the country) was as follows (in brackets we give the corresponding figures for July 1): Winter wheat 3.4 (3.4), summer wheat 5.6 (5.3) rye 4.8 (4.9), barley 5.1 (5.3), oats 5.3 (5.4), meslin 5.2 (5.3).

About 274,000 acres have been cultivated out of the whole agricultural area of reconquered Carelia (667,000 acres). In the Spring, notwithstanding the dearth of labour and the war, 179,700 acres were cultivated. Of this acreage, 79,000 were sown to oats, 51,600 to Spring wheat, 30,400 to barley and 1,300 to meslin.

According to press information, the area to winter wheat in 1942 would be only 38,300 acres against 44,700 in 1941. Corresponding figures for rye would be, respectively, 412,700 and 538,700 acres. The total area to these most important cereals would thus be 451,000 acres. It is the opinion of competent agricultural authorities that this total to wheat and rye could be increased next year of about 74,100 acres in Carelia.

France: According to press information at the end of July, the wheat harvest has been comparatively good. Storing and threshing are going on satisfactorily. In order to encourage farmers to intensify their work, the syndicates of agricultural associations have instituted threshing premiums. Special prices have been allowed for highest yields.

Greece: The Ministry of National Production has recently issued a decree which threatens very severe penalties against people who fail to cultivate their land, or who will leave their land uncultivated during the new agricultural season.

Hungary: During the first half of June, the weather was quite favourable to cereal crops, with the exception of the comparatively small areas where storms caused some damages. Wheat sowings had continued to improve, and towards the midle of June they had eared nearly everywhere. At that time, flowering was already over or was just on in the regions of the wide Hungarian plains (Alföld) and in the southern regions of the country. In a number of places, winter wheat sowings are thin and low, but, here and there, they show a fine green colour and appear healthy. Spring wheat is tufty enough and straw is high.

Rye is generally thin and low, but ears are developping in a satisfactory manner.

Winter barley is also rather thin and low, while Spring barley is tufty and is developping satisfactorly. In some spots, this last variety is infested by weeds.

Oats are developping well and are sufficiently tufty, but the crop is often infested by weeds.

During the second half of June, the weather was favourable to the formation and ripening of the seeds of straw cereals. In the first week of July, harvesting of winter wheat began in several places. At that time, spring wheat was developping well. In some places, and especially in the southern part of the country, rye harvesting had started. Rye ears are well developped.

In order to avoid the loss of seeds during the operations before threshing, the Ministry of Agriculture warned farmers again that harvesting of cereal crops must begin before grains are entirely ripe. As regards oats, the Government issued a decree whereby the harvest of this cereal while still green is forbidden if the crop is destined to the production of seeds.

About the middle of July, the condition of cereal crops was as follows: thanks to warm, and in some days very warm, weather, wheat ripened rapidly all over the country, and harvest had begun except in mountaineous regions; rye harvesting was actively

going on everywhere, storing and threshing had been started. With the exception of mountaineous regions, the harvesting of winter barley was over and that of spring barley had begun. In many regions oats were already ripening, but late seeds are still green and in the mountains the crop is just beginning to ear.

Ireland: The following table contains the final estimates of the cereal crops in Ireland in 1941, according to the official reports received from the Department af Agriculture in Dublin.

Crops	Area (000 acres) 1941	1940	Average 1935-39	% 1941 1940 = 100	% 1941 Average = 100	Production (000 centals and 000 bushels) 1941	1940	Average 1935-39	% 1941 1940 = 100	% 1941 Average = 100
Wheat	463	305	225	151.7	206.1	9,753 16,255	7,008 11,681	4,613 7,689	139.2	211.4
Rye	3.0	2.7	2.0	113.0	153.0	50 90	46 82	33 60	109.4	151.3
Barley	163	132	118	123.5	138.2	3,201 6,670	3,111 6,481	2,598 5,413	102.9	123.2
Oats	782	681	571	114.9	137.1	15,331 47,910	16,226 50,707	12,565 39,265	94.5	122.0

The area under cereals in 1942 shows furthers increases in comparison to those of preceeding years:

Area in thousand acres.

Cereals	1942	1941	Average 1936-40	% 1942 1941 = 100	% 1942 Average = 100
Wheat	585	463	253	126.3	231.1
Barley	186	163	117	113.9	159.1
Oats	881	782	584	112.6	150.8

Norway: Towards the middle of July, the condition of the wheat crop was generally good.

Portugal: Early forecasts indicated a record harvest, but now they are not so good. It has been noticed that rather than to the scarcity of rain the worst crops in Portugal are to be attributed to too much or untimely rainfalls. This has been the case in late weeks: cereals have suffered on account of rains during the period of ripening. Consequently, a record crop is no longer to be expected. Competent authorities, however, hope that yields will be sufficient to cover the wheat needs of the country. The same situation holds good for rye and barley.

Romania: Towards the middle of June, abundant rains over nearly the whole country, improved considerably the condition of cereal crops, especially in Moldavia where farmers were quite worried on account of drought. At that time, the condition of cereals was generally good. During the second half of June and the first two weeks in July, the weather was very warm and moderately rainy. On June 30, the Romanian Government could announce that 94 per cent of the plan for Spring sowings had been realised, notwistanding unfavourable weather conditions, the dearth of labour and the difficulties of transports. No official statement is yet available regarding the estimate on the yield of cereals. It is certain, however, that yields were quite different from one region to another and even from one holding to the other. Yields of winter wheat are rather weak, but quality is generally good.

According to the plan for the 1942-43 season, Romania will sow very large areas to winter wheat. All necessary measures are being taken to insure seeds to farmers,

and to improve at the same time agricultural technique. A statistical book has been prepared in all communes, containing the complete list of farmers. In the book will be registered the exact size of sown areas and of the production of each crop. In order to increase wheat yields, farmers are obliged to plow the land twice before seeding.

Sweden: Heavy rains during the second part of May had a very favourable influence, and forecasts are generally more optimistic than last year.

During the month of June the weather was rather cold and in the first two weeks in July it was below normal. It rained much, but in some regions rains were quite irregular. Vegetation was generally satisfactory but somewhat late, at the middle of July, on account of rains. The conditions of crops, expressed in the system of the country, compared with the corresponding date last year, were as follows: Winter wheat 2.4 (1.6), Spring wheat 3.1 (2.7), winter rye 3.2 (2.7) spring rye 2.0 (2.2), barley 3.1 (2.8), oats 3.0 (2.9), meslin 3.2 (2.8).

Switzerland: Notwithstanding some hailstorms in some regions, the weather during the month of June was favourable to crops. Cereals appear in good condition. Rye fields appear somewhat thin. Autumn and Spring wheat and spelt promise a very good harvest. Up to the present day, very little laying has been registered. In some places barley has been infected by brown rust. Harvesting of autumn barley has begun and a fine yield is expected. Oats were damaged by the Frit fly, especially in the fields that had been sown late.

Weather in July has been very unsteady. Sunshine alternated with heavy rainfalls. In many regions, hailstorms caused heavy damage. Harvesting is actively under way. The fields which suffered during winter and which were thinned by sharp frost gave poor yields, especially in the case of rye and winter barley. Among wheat fields which stood rather thick, cereals were laid somewhat by the heavy rains in the last weeks. The yield, fortunately was not touched but modestly and, except Geneva and confining regions, where the drought caused some damage cerals, especially winter and summer wheat, spelt and summer barley promise good average yields. The results of threshing for rye and winter barley, obtained until now, are satisfactory. In some places foot-rot and rust have caused certain demage. In these casees there are to be expected but poor yields.

The following table is showing the condition of the various crops, exressed in the form of index-numbers (basis a very good crop made equal to 100):

	August 1, 1942	July 1, 1942	August 1, 1941
Autumn Wheat	79	80	82
Spring Wheat	79	78	80
Autumn Rye	70	72	81
Spring Rye	74	73	77
Autumn Barley	75	77	80
Spring Barley	75	77	75
Oats	79	78	82
Meslin	77	79	81
Spelt	80	82	83

Argentina: The intense and prolougued drought which has prevailed all over the country since the month of June, hindered the seeding of wheat and other cereals.

Brazil: The Government is planning to increase the acreage to cereals. Technicians have been charged to visit the country and give farmers practical advice to that end.

Canada: The first estimates on acreage to cereals are the following:

Acreage.

(in 000 acres)

Crops	1942	1941	Average 1936/1940	1941 = 100	% 1942 Average = 100
Spring Wheat	21,312	21,700	25,822	98.2	82.5
Barley	7,200	5,449	4,382	132.1	164.3
Oats	15,225	13,841	12,887	110.0	118.1

The production of Spring wheat appears to be very abundant, in spite of the decrease of acreage. This favourable forecast is based on the exceptionally high yield of 27 bushels per acre. The condition of the crop, which at August 1 was quoted 149 per cent. against 72 per cent. at August 1. 1941, allows a forecast of over 330,000,000 centals (550,000,000 bush.) against 167,400,000 centals (279,000,000 bush.) in 1941 and an average of about 208,332,000 centals (347,220,000 bush.).

United States: According to information available, the production of cereals is estimated officially as follows:

Production

(in thousand)

		1942	1941	Average 1936-40	% 1942 1941 = 100	% 1942 Average = 100
Total Wheat . . .	centals	573,000	567,600	480,273	101.0	119.3
	bushels	955,000	946,000	800,455		
Winter Wheat . .	centals	418,800	402,600	366,327	104.0	114.3
	bushels	698,000	671,000	610,545		
Spring Wheat .	centals	154,200	165,000	113,946	93.5	135.3
	bushels	257,000	275,000	189,911		
(inc. durum) . .	centals	(22,800)	(24,600)	(17,494)	92.7	130.3
	bushels	(38,000)	(41,000)	(29,156)		
Rye	centals	33,040	25,307	23,561	130.6	140.2
	bushels	59,000	45,191	42,073		
Barley	centals	200,592	172,180	115,662	116.5	173.4
	bushels	417,900	358,709	240,962		
Oats	centals	426,240	376,354	331,976	113.3	128.4
	bushels	1,332,000	1,176,107	1,037,424		

Weather conditions favoured the crop considerably. Yields are in all cases, except barley, higher than those of last year.

Manchukuo: On mid- July the conditions of cereal crops were favourable in general. Situation was better in the north than in the south, wehre persistant drought had caused some damage. Production of wheat and millet is expected below average.

Palestine: The official estimate places wheat production of 1942 at 2,425,000 centals or 4,042,000 bushels against 2,094,000 centals or 3,491,000 bushels in 1941 and 2,086,000 centals or 3,477,000 bushels in the five year average 1936-1940, percentages 115.8 and 116.3. Barley production is estimated at 2,646,000 centals or 5,512,000 bushels against 1,102,000 centals or 2,297,000 bushels in 1941 and 1,703,000 centals or 3,549.000 bushels in average, percentages: 240.0 and 155.3 respectively. This abaundant production of cereals is mostly due to favourable weather conditions and to the increase of demand.

Egypte: The official estimate, published by the Ministry of Agriculture, places wheat production of 1942 at more than 33,069,000 centals or 55,115,000 bushels, an increase

of 33 per cent. on last year (24,918,000 centals or 41,529,000 bushels) and of 17 per cent. on the five-year average 1936-1940 (28,322,000 centals or 47,203,000 bushels) constituted by aboundant crops.

Union of South Africa: An official estimate, recently published, places wheat production in 1941-42 at about 8,246,000 centals or 13,743,000 bushels, against 9,884,000 centals or 16, 473,000 bushels in 1940-41 and 9,771,000 centals or 16,285,000 bushels in the five-year average 1935-36 to 1939-40; percentages: 83.4 and 84.4. These figures refer to quantities produced by European farmers.

CURRENT INFORMATION ON MAIZE.

Hungary: Owing to the bad quality of seeds, maize sprung up badly. Towards the middle of June, the first tillage of early seedings was over, while the second tillage and ridging were going on. During the first part of June, the weather was favourable to the crop. Late sowings are generally heavily infested by weeds. Their first tillage was on by the middle of June. The maize crop, at the beginning of July, needed rain. Cultures are very thin in spots.

About the middle of July, the second tillage was over everywhere.

Romania: Rain and cold during the Spring obliged the farmers to continue their maize sowings till nearly the middle of June. Rainfalls at the middle of June were very favourable to the crops that had well developped by that time. At the middle of July, maize was in normal condition and farmers were tilling the soil a second time.

Switzerland: At the beginning of July, the condition of the maize crop, according to the system of the country, was quoted 74, against 77 at the first of June 1942 and 63 at the first of July 1941.

Argentina: The second official estimate, published July 18, puts the 1941-42 production of maize to 201,459,000 centals (359,749,000 bushels), against 225,710,000 centals (403,055,000 bushels) and an average of 169,115,000 centals (301,991,000 bushels) in the five preceding years. The crop of this year although it is 10.7 per cent lower than the excellent one of 1940/41, appears quite abundant. In fact it is over 19.1 per cent above the average of the five previous years, notwistanding a considerable reduction of sown area (12,300,000 acres) which is respectively 18.0 and 22.6 per cent smaller than that of the year 1940/41 and the average. The fine results of the present season are to be attributed exclusively to the very favourable weather conditions that prevailed during the whole period of the vegetative cycle of the crop.

United States: Total area under maize for all purposes, is estimated in 1942 at 89,408,000 acres, against 85,943,000 acres in in 1941 and 90,772,400 acres in the five-year average 1936-1940; percentages: 104.0 and 98.5. Production is expected to be about 1,542,000,000 centals or 2,754,000,000 against 1,496,880,000 centals or 2,673,000,000 bushels in 1941 und 1,318,453,000 centals or 2,354,381,000 bushels in the five-year average 1936-1940; percentages 103.0 and 117.0.

CURRENT INFORMATION ON RICE.

Romania: The area destined to rice for the 1942 season is somewhat bigger than that of the year 1941. About July 10, the rice crop was coming up satisfactorily. A good harvest is expected.

Manchukuo: On mid-July the condition of rice crops was favourable in general. Situation was better in the north than in the south, where persistant drought had caused damage of a certain importance. The production is expected to be below average.

CURRENT INFORMATION ON POTATOES.

Bulgaria: Generally speaking, weather conditions during the present season have been very favourable to the potato crop. The good condition of the culture and the considerable increase of area to potatoes make it probable that production this year will be very abundant.

Denmark: According to press information, during the first ten days in July, potatoes developped quite well owing to warm weather and rainfalls.

On August 1, 1942 the crop condition of potatoes (according to the system of the Institute) was 95 against 91 on July 1, 1942 and 87 on August 1, 1941.

Spain: At the middle of July, early potatoes were in full bloom. The condition of the potato crop was good and forecasts were favourable.

Estonia: According to press information, the area to be planted to potatoes in 1942 as established by the plan, would be 297,000 acres against 220,000 in 1941, and an average of 195,500 in the four year period 1936-1939. Percentages: 134,8 per cent and 151,7 per cent.

According to press information, 10,900 acres were sown to potatoes in reconquered Carelia.

Finland: On August 1, the crop candition (according to the system of the country) was 5.4, against 5.3 on July 1. The crop is somewhat retarded by cause of excessive rainfalls and too low temperatures.

France: According to press information at the end of July drought has damaged the potato crop. It seems however, that lately the situation has improved, owing to rains.

Hungary: Towards the middle of June, potatoes were growing well. Early potatoes appeared on the market. At the beginning of July, earthing up was almost over. Crops had begun to suffer owing to the scarcity of rains, especially over sandy soil.

By the middle of July, in sandy and dry soils where the crop was not benefited by rainfalls, the plants were so burned up that in very many places it was necessary to pull out the tubers.

Ireland: According to the most recent report the area cultivated to potatoes in 1941 was 428,000 acres, against 367,000 in 1940 and 328,000 on the average in the preceding 5-year period; percentages: 116.7 and 130.5. The corresponding production is estimated at about 82,646,000 centals (137,743,000 bushels) against 69,849,000 (116,416,000 and 58,975,000 (98,291,000); percentages: 118.3 and 140.1.

The area under potatoes in 1942 is about 432,000 acres, against 428,000 acres in 1941 and 334,000 acres in the five-year average 1936-1940; percentages: 101.0 and 129.3

Norway: At the middle of July, the condition of the potato crop was generally good.

According to press information, the area destined to potatoes this year was double that of last year.

Sweden: About the middle of July, the potato crops were from one to two weeks late. Their condition, expressed in the system of the country, was 3,0 against 3,1 at the corresponding date last year.

Switzerland: The potato crop has good appearance und promises good yields. At the same time, however, there are crops with clear signs of degeneration, whieh will give but poor yields. Evidently the crops have suffered heavily by degeneration diseases during the

winter of 1941. That has been noticed also in the case of the variety "Ackersegen", which is of much importance in Switzerland. In cases where good imported seeds had lacked, the crops of this variety are in relatively unfavourable condition. The sound crops of all varieties, harvested until now, gave satisfactory yields. In cases where the treatment was done in good time, the potato crops were preserved from diseases. The degeneration, naturally, has made further progress with the crops derivating from seeds of crops already degenerated. It is not possible, therefore, to expect a very good output. On the base of a probable area sown to potatoes of of 173,000 acres an oatput of probably 26 million centals (44 million bushels) might be expected.

The " doryphore " was more diffused than in last years. Thanks to more intensive control, damage is less seriuts than expected.

At the beginning of August, the condition of the potatoes (according to the system af the Institute) was 75, against 77 on July 1, 1942 and 69 on August 1, 1941.

SUGAR SEASON.

After the period of favourable weather in the first two weeks in June, the sugar beet crop was subject to a new wave of cold which, especially in the countries of central and northern Europe, further delayed the vegetation of the plants that in their turn had been sown with some retard. In fact, in these countries, the cold weather in the second part of June, besides hindering the growth of sugar beets, caused some irregularities in their vegetation and a retard of about 15 days over normal years. In some countries, as in Finland, the dearth of labour has contributed to make the conditions of cultures considerably more difficult than in ordinary times. In other countries, such as Denmark, where the larvae of harmful insects have caused damages of a certain importance, parasites have injured the crops.

Conditions changed again and in July the weather was variable with frequent and in some cases even heavy rainfalls. Field operations proceded regularly in most of the countries. Wet weather in July was favourable to the crops but too low temperatures hindered somewhat the vegetation. In some regions of southern Europe the growth of beets was seriously hindered by the drought. Some damage has been caused by insects. By the end of July, however, the general conditions of the beet crop in Europe were considered as satisfactory and in any case better than those of last month.

Yet, owing to the considerable retard in the vegetation, the weight of the roots and leaves is considerably below average at this time of the season. As the percentage of sugar is low, in a root of a limited weight it does not amount to over 60 per cent. of what is the normal sugar content. The retard of the vegetation has continued also during the second part of July.

As regards sugar beet areas in the different countries, present estimates indicate that they are practically the same this year as last, in Bulgaria, Denmark, Lithuania, the United Kingdom, and Sweden. It is probable however, that

more precise estimates may show that in some of these countries, acreages to sugar beets have been increased.

A decrease is registered, on the contrary, in some other European countries, especially Croatia, Finland, Hungary, Serbia and Slovakia. It is probable that the decrease reported from these countries may be confirmed. It must be noticed, however, that they are not very important as sugar producers. Spain, which is a rather important sugar producing country, foresees a decrease of from 15 to 20 per cent, in spite of the efforts made by the Government for an increase of area to beets, with a view to bringing sugar production back again to the pre-civil war level, when it was enough to cover the needs of the country.

Acreage of Sugar-beet.

COUNTRIES	1942 (*)	1941	Average 1936 to 1940	% 1942: 1941 = 100	% 1942: Average = 100
	acres	acres	acres		
Belgium	(1) 126,752	119,727	121,686	106	104
Bulgaria	(2) 54,000	(2) 52,260	27,103	104	201
Croatia	10,600	(2) 21,333	(3) 15,365	50	69
Denmark	114,000	119,000	99,000	96	115
Spain	136,000	161,000	183,355	85	74
Finland	(1) 6,400	8,280	10,300	78	62
France	(1) 507,000	(1) 482,000	523,970	105	97
Hungary	(2) 161,000	(2) 200,000	122,519	81	131
Ireland	92,000	78,390	55,771	117	164
Italy	370,000	350,000	318,622	107	116
Latvia	(1) 50,000	(1) 30,881	32,979	160	150
Lithuania	(1) 35,290	(1) 36,041	22,220	98	159
United Kingdom	(2) 370,000	(2) 370,000	337,141	100	110
Serbia	(1) 31,600	(1) 35,410	82,594	89	—
Slovakia	40,000	47,000	(4) 39,199	84	101
Sweden	131,000	131,000	129,693	100	101
Switzerland	8,900	8,400	6,934	106	128
—					
Turkey	(1) 77,000	(1) 101,000	74,271	76	103

(*) Approximate data. — (1) Estimate of the International Association for Sugar Statistics. — (2) F. O. Licht's estimate. — (3) Year 1940. — (4) Average of two years.

The countries which, compared with last year, register an increase of areas to sugar beets, are Belgium, Ireland, Italy, Latvia and above all France which is about to reach again the pre-war level.

The countries figuring in the annexed table cover over one half of the whole sugar beet acreage of Europe, not including the U. S. S. R. The acreage dedicated to this crop in 1942 by all these countries is slightly lower than in 1941. The condition of the crop is generally good, but vegetation is late. It is too early, however, to forecast for these countries a contraction in the production, because the crops have plenty of time to pick up and even to compensate with a good unit production whatever deficit might be caused by a reduction of area.

E. R.

CURRENT INFORMATION ON SUGAR.

Belgium: Results of the weekly analyses of sugarbeets:

WEEK	Average weight of root			Average weight of leaves			Sugar content			Weight of sugar per root		
	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940
	oz.	oz.	oz	oz.	oz.	oz.	%	%	%	oz.	oz.	oz.
3rd. week of July .	3.6	4.3	4.8	13.8	13.9	17.1	8.1	9.1	9.2	0.3	0.4	0.4
5th. week of July .	6.3	9.2	8.6	21.1	21.0	21.8	10.5	11.0	12.0	0.7	1.0	0.9

Denmark: Weather conditions during the first fifteen days in July caused a remarkable improvement in the crop condition of sugar beets.

On August 1, 1942 the crop condition of sugar beets (according to the system of the Institute) was 87 against 81 on July 1, 1942 and 90 on August 1, 1941.

Results of the weekly analyses of sugarbeets:

WEEK	Average weight of root			Average weight of leaves			Sugar content			Weight of sugar per root		
	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940
	oz.	oz.	oz.	oz.	oz.	oz.	%	%	%	oz.	oz.	oz.
1st. week of August	3.3	7.7	8.2	13.8	16.1	16.0	9.7	9.6	12.3	0.4	0.8	1.0
2nd. week of August	5.3	9.1	9.9	15.0	16.8	16.6	11.6	11.6	13.3	0.6	1.1	1.3

Spain: According to a statement by sugar refiners, the production of beet sugar in 1941-42 amounted to about 3,550,000 centals (177,500 sh. tons), or about the same as in 1940-41 when production amounted to 3,530,000 centals (176,500 sh. tons). This production is considerably below the average of pre-civil war times, when it amounted to 6,200,000 cent. (310,000 sh. tons.), and was sufficient for the needs of the country. As it had been foreseen, farmers gave the preference to other more remunerative crops than beets whose prices were considered too low by beet growers.

The production of canesugar in 1941-42 is estimated at 118,000 centals (5,900 sh. tons) against 198,000 (9,900) in 1940-41 and an average of 350,000 (17,500) in 1935-36 to 1939-40; percentages, 60.0 and 34.0.

Finland: Owing to the dearth of labour and the late fixing of prices of beets, the areas destined to this crop this year has resulted smaller than had been forecast at the time of sowing.

Hungary: By the middle of June, sugar beets were growing very well. The second (and in some spots, the third) tilth were going on.

About the middle of July, the third hoeying was mostly over.

Ireland: According to the most recent report area the cultivated to sugar beet in 1941 is 78,400 acres, against 62,900 in 1940 and 54,600 on the average of the preceding 5-year period; percentages: 124.6 and 143.5. The corresponding production is estimated at about 16,118,000 centals (805,900 short tons) against 14,784,000 (739,200) and 11,803,000 (590,100); percentages: 109.0 and 136.6. The production of beet sugar in 1941-42 is estimated at 2,352,600 centals (117,600 sh. tons) against 2,305,600 (115,300) in 1940-41 and an average of 1,774,700 (88,700) in 1935-36 to 1939-40; percentages, 102.0 and 132.6.

Italy: In 1941, owing to the competition of other more remunerative crops, the area sown to sugar beets was smaller than had been fixed by the Government. The situation for the year 1942 appeared even more unfavourable, because, in the meantime, the prices of competing products had further increased and it seemed very little probable that the area to sugar beets could amount to the figure of 418,000 acres fixed by the Ministry of Agriculture and Forestry for the present year.

In fact, in the Fall of 1941, advices had already begun to reach the Ministry that farmers showed a tendency to devote to other crops the area which had been fixed for the sugar beet crop. The competent Authorities, then, increased the prices of beets and assigned a compensation for transportation. But these measures were also unavailable to encourage beet growers who were worried by other difficulties, such as the scarcity of fertilizers, labour and means of transportation.

Consequently, notwistanding the intense propaganda carried on by sugar factories, the different Bureaus dealing with sugar production and by the political authorities, the signing of contracts for the sugar beet crops was proceeding slowly and among a number of difficulties, except in the Polesine and in some provinces of Venetia.

It was then that, about the middle of March, the Ministry of Agriculture instructed the Prefects to make obligatory the raising of beets in the measure of the areas that had been sown to this crop in 1940 and 1941. The signing of contracts became more satisfactory, but the integral application of the ministerial decree met with a number of difficulties, because in some cases farmers had started growing wheat, in other cases they had already taken all necessary measures to begin Spring sowings. All in all, it is estimated that the area to beets this year amounts to no more than 370,000 acres.

The condition of the crop is good, notwistanding, among other things, the lack of potash fertilizers. Hoeying which this year, on account of the scarcity of chemical fertilizers is so important, is going on rapidly and in favourable conditions of climate and soil. The development of the leaves is better in northern than in central Italy, where it is rather irregular.

In areas sown to imported seeds, very considerable inequalities are registered, which are the consequence of the weak germinative energy of the seed.

The acreage that had to be sown over again, amounts to 5,000 acres; but not all beet cultivations that were destroyed could be re-seeded, because in some cases the season was too advanced and farmers had to replace them with other crops. Damages done by cassidy have been reported.

Sweden: Sugar beets, in some places, were damaged by pests. At July 15, the condition of the crop, expressed in the system of the country, was 2,7 against 2.8 at the corresponding date last year.

Switzerland: At the beginning of July, the condition of the sugar beet crop was quoted, according to the system of the country, 76 against 71 at the first of June 1942 and 75 at the first of July 1941.

Java: According to press information, 13 out of the 84 sugar refineries at Java have resumed their activity and the remaining will resume work by the 31st of August. Crop forecasts are good.

CURRENT INFORMATION ON VINES.

Bulgaria: Production of grapes promises to be much better, in quantity and in quality, than that of previous two years.

Spain: Towards the middle of July, the general condition of vineyards promised an average crop.

According to press information at the end of July, vines in most of wine regions have yielded a good crop. This is especially the case in the regions of Rioja, Navarre, Arragon, and Catalonia, while lower yields are forecast in Castille. Owing to damages caused by pests, the forecast on production in the province of Mancha, which generally yields the highest amount of wine, is for an average yield.

France: According to press information, the condition of vineyards is, on the whole, quite favourable. Farmers are much more optimistic than some time ago on the size of vintage. Drought has preserved vines from cryptogamic maladies. Vintages will be started early: in the South they will begin in the first days in September.

At the beginning of July, vintage prospects were more satisfactory than at the beginning of June.

By the and of July, favourable crop prospects were confirmed. On the whole, the drought has preserved the plants from cryptogamic diseases. The vintage will be probably early this year.

Hungary: During the whole month of June, the weather was favourable to the development of vines. Mildew has appeared in all the wine regions of the country, but damages are not serious.

About the middle of July, fine weather helped the good progress of vines.

Italy: According to press information, production of grapes is expected to be good to very good. Except in some regions, the damages caused by insects and diseases are unimportant.

Romania: About the middle of July, the conditions of vineyards was good. After a series of poor vintages, it is forecast, this year, that the yield will be average and even better than average.

Switzerland: At the beginning of July, the condition of vineyards according to the system of the country was quoted 73, against 77 at the first of June 1942 and 64 at the first of July 1941.

The vines showed an uneven appearance. Besides very good prospects, yields will be in some cases only average or even poor. Generally, the grape production is estimated as average to good. It must be considered, however, that, besides the losses resulted from insects and pests, serious damage was caused by hail. The scarsity of anti-cryptogamics and the lack of labur hindered the combating of diseases. The grapes have very good appearance and show rather advanced development. If the weather conditions remain favourable, the quality of the grapes promises to become good.

Algeria: At the end of June the condition of vineyards was good and crop forecasts were favourable.

Tunisia: About the end of June, the appearence of vineyards was favourable. A good crop is expected.

CURRENT INFORMATION ON OLIVES.

Bulgaria: A ministerial decree was issued recently which instituted State monopoly over production, transformation and trade of olives. By this decree, the *Direction for the purchase and exportation of cereals* is charged with the gathering of olives in State domains and mortgaged holdings situated in the region of the litoral of the Aegean sea and in the islands of Thasos and Samothrace. Private farmers are obliged

to deliver all their olive crop (except for the quantities reserved for the needs of the household), to the *Direction for the purchase and exportation of cereals* which is charged also with the extraction and refining of oil.

Portugal: The olive crop last year was above average: forecasts this year are good.

CURRENT INFORMATION ON FLAX.

Estonia: According to press information, it is planned to sow to flax in 1942 74,000 acres against 57,000 in 1941 and an average of 65,500 in the four years 1936-1939. Percentages: 130.4 per cent. and 113.2 per cent.

Harvest forecasts indicate a figure of 220,000 centals (400,000 bushels) of grains.

Greece: According to recent information from the Ministry of Agriculture the production of flax a crop recently introduced in Greece) in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 6,630 centals.

The production of flax in 1941, distributed according to the different regions of the country, was as follows:

	Production	
	centals	pounds
Central Greece	110	11,000
Peloponnesus	1,630	163,000
Ionian Islands	595	59,500
Thessalonica	175	17,500
Macedonia	660	66,000
Epirus	1,390	139,000
Crete	2,070	207,200
Total	6,630	663,200

Hungary: By the middle of June, flax for seed and harl was growing well. Cultures were tufty enough and high. Flowering was over in spots.

About the middle of July, the crop was tufty but generally low and often invaded by weeds.

Ireland: According to the most recent report the area cultivated to flax in 1941 was 15,800 acres, against 10,100 in 1940 and 4,400 on the average of the preceding 5-year period; percentages: 155.4 and 354.7. The corresponding production is estimated at about 60,400 centals against 44,800 and 19,300; percentages: 134.7 and 313.2.

Argentina: Seedings of flax were hindered by an intense and prolongued drought which has prevailed in the country since the month of June.

Canada: The area under flax in 1942 in estimated at about 1,475,000 acres an increase of 54 per cent. on last year 958,000 acres and of 352 per cent. on the five-year average 1936-1940. Seed production was of 3,625,000 centals or 6,473,000 bushels in 1941 and of 1,013,000 centals or 1,809,000 bushels in the average.

United States: The area under flax in 1942 is estimated at 4,400,000 acres against 3,228,000 acres in 1941 and 1,696,000 acres in the five-year average 1936-1940, percentages: 136.3 and 259.4. Seed production is estimated at 23,520,000 centals or 42 million bushels against 17,640,000 centals or 31.5 million bushels in 1941 and 8,051,000 centals or 14.4 million bushels in the average; percentages: 133.3 and 292.1.

Manchukuo: Thanks to favourable weather conditions, on mid-July the production of flax was expected as abundant.

CURRENT INFORMATION ON COTTON.

Greece: According to recent information from the Ministry of Agriculture the production of cotton (ginned) in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 197,970 centals (41,420 bales) against 373,000 centals (78,000 bales) in 1940 (Greece within the old frontiers). The production of cotton (lint) in 1941, distributed according to the different regions of the country, was as follows:

	Production centals	Production bales
Central Greece	98,200	20,550
Peloponnesus	15,660	3,280
Cyclades	100	20
Ionian Islands	70	10
Thessalonica	38,940	8,150
Macedonia	42,330	8,850
Epirus	40	10
Crete	90	20
Aegean Islands	2,540	530
Total	197,970	41,420

Argentina: The production of ginned cotton in the 1941-42 season is estimated at 1,587,000 centals (332,000 bales) a decrease of 176,000 centals (36,900 bales) in comparison with the preceding estimate. Notwithstanding this however, the 1941-42 production is 43.0 per cent. above that of the 1940-41 season (1,110,000 centals – 232,000 bales) and 15.0 per cent. above the average of the preceding five years (1,380,000 centals – 281,000 bales). The exportable surplus of the present season is estimated at about 551,000 centals (115,000 bales). Lint is of good quality, and current prices on the home market are higher than last year.

Brazil: The Government is planning to increase the acreage to cotton. For this purpose, technicians have been charged to visit the country and furnish farmers with practical advice.

United States: According to information on the production of cotton published by the Washington Department of Agriculture in July and August, cotton picking will be done under exceptionally favourable conditions. The area to cotton at the beginning of July amounted to 24,005,000 acres, showing an increase of 3.8 per cent. as compared with last year, (23,130,000 acres), but being 13.8 per cent. below the figure of 27,857,800 acres averaged in the years 1936 to 1940 all of which showed higher figures than that of this year.

Wheather conditions were generally very favourable to the crop from the beginning, and damages done by boll weevil are insignificant. The cotton area to be harvested will be estimated for the first time on September 8. Taking into account the fact that this year abandonment for natural causes is very limited, it may be estimated that the acreage to be harvested will amount to about 23,445,000 acres against 22,240,000 actually harvested last year and an average of 27,058,400 acres harvested during the years 1936 to 1940. This would mean, respectively, an increase of 5,4 per cent. and a decrease of 13.4 per cent. The figure of 23,445,000 acres is obtained by deducting about 2 per cent. from the acreage in cultivation at July 1, 1942 (24,005,000 acres). This would very nearly corrrepond to the average percentage of areas that were abandoned for natural causes after July 1, during the years 1932 to 1941.

At August 1, the condition of the crop was quoted 79 per cent. of normal, again 72 at August 1, 1941 and an average of 73 from 1931 to 1940. After the adoption of this system of notation in 1924, this percentage was surpassed only once on August 1, 1937, when 81 per cent. was registered.

Production is officially estimated at 13,085,000 bales of ginned cotton, against 10,976,000 bales in 1941 and an average of 13,534,000 bales in the years 1936 to 1940: percentages, 119.2 and 96.7. The official estimate was 500,000 bales over the highest market forecasts.

This abundant production is due to the exceptionally high yield of 269.7 lb. ginned cotton per acre, against 232.0 lb. last year and the average of 215.0 lb. in the years 1931 to 1940; percentages: 116.2 and 125.4. The 1942 yield is the highest ever registered in the United States, with the exception of the yield of the record crop of 1937 which amounted to 269.9 lb. per acre. General conditions continue to be very favourable to picking, which is carried on rapidly. It is probable therefore that the next monthly estimates of yields will show some increases.

The consumption of all cottons in the United States during the cotton seaso 1941-42 which ended on July 31, 1942, has amounted to the record figure of over 11 million bales. This figure is higher than that of last year production. In the 1942-43 season, even if the volume of consumption should further increase, production is more than sufficient to cover all needs, including export demand, without touching the stocks.

Burma: According to press information, cotton production in Burma is estimated at 320,000 centals or 66,900 bales of 478lb. (70 per cent. below average) against 440,000 centals or 92,000 bales in 1940-41 and 457,000 centals or 95,500 bales in the five-year average of 1935-36 to 1939-40.

Irak: According to press information, the cotton crop harvested up to the end of June had yielded almost 20.000 bales.

Egypt: The official estimate, published by the Ministry of Agriculture, places the area under cotton at 729,000 acres against a market forecast of about 985,000 acres. This shows clearly, that farmers have planted much less cotton than was allowed to them by the law referring to the restriction of cotton crops. The area under cotton of last year was 1,706,000 acres and of 1,824,000 acres in the five-year average 1936-1940, a decline of more thaw 57 per cent. on last year and of 60 per cent. on the average. Consequently, the production is limitated on finest cotton in the best regions of the Delta, extending as much as possible the production of wheat, barley, maize, rice and millet. Considering the fact, that fine cotton gives poorer yields than long-medium staple cotton (Uppers) and taking in due account the scarsity of fertilizers, production can be estimated at about 3,307,000 centals or 692,000 bales of ginned cottons, against 7,992,000 centals or 1,672,000 bales in 1941 and of 9, 189,000 centals or 1,922,000 bales in the five-yéar average 1936-1940, a decline of about 60 per cent on last year and of 64 per cent. on average.

CURRENT INFORMATION ON HEMP.

Greece: According to recent information from the Ministry of Agriculture the production of hemp (a crop recently introduced in Greece) in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 6,078,000 pounds. The

production of hemp in 1941, distributed according to the different regions of the country, was as follows:

	Production pounds
Central Greece	8,820
Peloponnesus	41,890
Macedonia	5,079,470
Epirus	19,840
Crete	119,050
Aegean Islands	809,100
Total . . .	6,078,170

Hungary: By the middle of June, hemp for seed and harl was developping well. The seed crop was tufty and well proportioned, and the crop for harl was also rather tufty, but rather low here and there.

By the middle of July, the crop was growing satisfactorily. Stalks for tow were somewhat short.

CURRENT INFORMATION ON TOBACCO.

Greece: In order to encourage the culture of tobacco, the Government has taken a number of strong measures. The existing law concerning the size and property rights of areas destined to the tobacco crop during the present agricultural season, has been abolished. The limitation to the growing of certain qualities of tobacco has also been abrogated. The Ministry of Finances, in agreement with the Ministry of Agriculture, is authorized to take all necessary measures to encourage the raising of tobacco.

According to recent information from the Ministry of Agriculture the production of tobacco in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 32,368,400 pounds. The production of tobacco, in 1941, distributed according to the different regions of the country, was as follows:

	Production pounds
Central Greece	15,097,300
Peloponnesus	2,004,000
Cyclades	127,900
Thessalonica	2,680,800
Macedonia	11,569,900
Epirus	13,200
Crete	28,700
Aegean Islands	846,600
Total . . .	32,368,400

Hungary: Transplanted tobacco has taken well and by the middle of June it was vigorously developping. Tilling was about to begin.

About the middle of July, the development of the tobacco crop was late.

Ireland: According to the most recent report the area cultivated to tobacco in 1941 was 180 acres, against 143 in 1940 and 542 on the average in the preceding 5-year period; percentages: 125.9 and 33.3. The corresponding production is estimated at about 142,600 lb. against 124,100 and 314,000; percentages: 114.9 and 45.4.

Sweden: According to press information, tobacco growing this year has been greatly increased in southern regions. The area sown to tobacco this year amounts to

800 acres, against 690 acres last year. In 1941, 1,000,000 lbs. of raw tobacco had been harvested. This year weather conditions have been quite favourable. It is expected therefore that yields will be higher than last year. The gathering of leaves, however, may be delayed a couple of weeks.

Switzerland: The condition of the tobacco crop at the beginning of July, was quoted 72, according to the system of the country, against 79 at the first of June 1942 and 68 at July 1, 1941.

Ukraine: The area destined this year to the tobacco crop should amount to 150,000 acres. This means a 20 per cent increase over last year.

Turkey: According to the first estimate production of tabacco in 1942 is about 25 per cent. more than last year's production. The quality as well is considered as good.

CURRENT INFORMATION ON HOPS.

Hungary: About the middle of June, hops were developping well. Stalks were long and strong. By the middle of July, cones were large enough, but for their further growth, hops needed rain.

CURRENT INFORMATION ON OTHER PRODUCTS.

Cacao.

Trinidad: Cacao production in 1942 is estimated at 10,000,000 lb. as compared with 18,700,000 lb. in 1941 and 25,000,000 lb. in 1940. Percentages: 53.5 and 40.0

Groundnuts.

Greece: According to recent information from the Ministry of Agriculture the production of groundnuts in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted 15,850 to centals. The production of groundnuts in 1941, distributed according to the different regions of the country, was as follows:

	Production centals
Central Greece	20
Peloponnesus	10,450
Cyclades	130
Ionian Islands	90
Macedonia	595
Crete	4,235
Aegean Islands	330
Total	15,850

United States: The area under groundnuts in 1942 is estimated at 4,800,000 acres against 1,908,000 acres in 1941 and 1,736,000 acres in the five-year average 1936-1940; percentages: 251,6 and 276,5. Production is expected to be about 3,638 million lb. against 1,475 million lb. in 1941 and 1,339 million lb. in the average.

Colza and sesame.

General Government: According to press information, this Autumn 86,000 acres are going to be sown to winter colza, especially in the large agricultural holdings. The area to be sown to colza in each holding should not be less then 1.5 acres.

Greece: According to recent information from the Ministry of Agriculture the production, of sesamum in 1941 all over Greece (not including Thrace and Eastern Macedonia) amounted to 81,400 centals (4,100 short tons) against 410,700 centals (21,000 short tons) in 1939 (Greece within the old frontiers). The production of sesamum in 1941, distributed according to the different regions of the country, was as follows:

	Production	
	centals	short, tons
Central Greece	2,620	130
Peloponnesus	2,250	110
Cyclades	490	20
Ionian Islands	90	5
Thessalonica	11,420	570
Macedonia	55,030	2,750
Epirus	220	10
Crete	1,210	60
Aegean Islands	8,110	405
Total	81,440	4,060

Soya.

Hungary: By the middle of June, the soya crop was very tufty and developping well. Flowering had begun in the southern regions.

By the middle of July, the soja crop was doing good progress.

United States: The area under soya in 1942 is estimated at 14,000,000 acres against 5,918,000 acres in 1941 and 3,433,000 acres in the five-year average 1936-1940; percentags: 236.6 and 407.8.

Manchukuo: Thanks to favourable weather conditions, on mid-July, the soya production was expected to be good.

Sunflower.

Hungary: By the middle of June, early seeded sunflower was developping well. The second tillage was over. Late cultures have sprung irregularly, especially where no rain fell during the second part of June.

Owing to the drought, sunflower stalks in sandy soil were still very thin at the middle of July.

Jute.

India: According to official information, a further restriction of the jute acreage has been decided. For further information, regarding previous situation, see *Crop Report* of December 1941.

CURRENT INFORMATION ON FODDER CROPS.

Denmark: According to press information during the first ten days in July, harvest forecasts have lately improved. Clover and lucerne are in fine condition; haymaking has been started, but, owing to the spring drought, yields are meagre. Beets suffered from damages done by pests; but, thanks to good weather, their condition is better than had been forecast.

After the first cut, the growth of grass and of green fodder was vigorurous by the beginning of August, thanks to wet weather in the second half of July.

The crop condition of the most important fodder crops (according to the system of the Institute) was as follows:

	August 1, 1942	July 1, 1942	August 1, 1941
Rotation meadows	60	62	52
Alfalfa	93	94	—
Permanent meadows	65	66	65
Pastures	72	68	60
Turnips	88	82	89
Carrots for fodder	80	76	86
Sugar beets for fodder	81	—	88

Finland: On August 1, the condition of rotation meadows (according to the system of the country) was 4.2, against 5.1 on July 1. The corresponding figures for the other fodder crops are 4.9 and 4.7.

France: According to press information at the end of July, forage crops were damaged by drought in the un-occupied zone of the country. Yields appear lower than in 1940; in some regions, losses amounted to from 40 to 60 per cent. It is easy to foresee the repercussions of this situation on livestock raising. It is expected that a considerable number of young cattle will have to be slaughtered for lack of forage.

Hungary: By the middle of June, forage beets were growing well. The first cut of clover and lucerne gave a good yield and quality was good nearly everywhere. Among the other forage crops, vetches appeared in good condition. Sowings of maize for green forage had begun.

The first cut of natural meadows that were not flooded, yielded a good quality hay; quantity was above normal. Towards the middle of June, part of pasturages were still flooded. Vegetation of grass over dry pastures was good enough and yielded sufficient feed for livestock.

At the beginning of July, harvesting and storing of hay of natural meadows were over. The second crop was not very satisfactory owing to the drought. At that time, pastures continued to yield sufficient feed for the cattle, even though big damages had been done by floods.

About the middle of July, the first and in some places the second cut of the clover and lucerne crops gave fine yields and were generally already stored to shelter them from the rain. The quality of hay is first class. Hay harvesting over natural meadows was also good both as to quantity and quality. Owing to the drought, only in low pastures can cattle find grass.

Ireland: According to the most recent information communicated by the Department of Agriculture in Dublin, the total area of rotation and permanent meadows is estimated for 1941 at 2,004,000 acres, against 2,126,000 in 1940 and 2,064,000 on the average of the preceding 5-year period; percentages: 94.3 and 97.1. The corresponding

total production of hay amounted to 94,625,000 centals (4,731,000 short tons) against 104,443,000 (5,222,000) in 1940 and 99,687,000 (4,984,000) on the average; percentages: 90.6 and 94.9.

The area cultivated to mangels in 1941 is 96,000 acres, against 93,400 in 1940 and 85,300 on the average in the preceding 5-year period; percentages: 102.8 and 112.5. The corresponding production is estimated at about 39,429,000 centals (1,971,000 short tons) against 38,075,000 (1,904,000) and 36,428,000 (1,821,000); percentages: 103.6 and 108.2.

The area cultivated to turnips in 1941 was 157,000 acres, against 151,000 in 1940 and 147,000 on the average in the preceding 5-year period; percentages: 104.0 and 106.8. The corresponding production is estimated at about 58,947,000 centals (2,947,000) short tons) against 54,671,000 (2,734,000) and 59,487,000 (2,974,000); percentages: 107.8 and 99.1.

The area sown to mangels in 1942 amounts to about 108,000 acres, against 96,000 in 1941 and an average of 87,000 acres during the years 1936/1940; percentages: 113.0 and 124.5.

Norway: According to press information, hay harvest forecasts had improved, by the middle of July, especially in the South of the country. Forecasts on yields are good; not so good as regards quality.

Sweden: Damages done by drought in 1941 have not been made up for entirely yet, and by the middle of July the conditions of the most important forage crops, as compared with last year at the same date, was quoted as follows in the system of the country: natural meadows 2.7 (2.3), rotation meadows 2.9 (1.7), forage roots and tubers 2.8 (2.4).

Switzerland: The condition of the various feed crops is indicated as follows (basis a good crop made equal to 100):

	I-VII-1942	I-VI-1942	I-VII-1941
Natural meadows	73	76	76
Artificial meadows (clover, alfalfa, etc.)	79	81	81
Pastures	81	80	69
Mangels	75	74	73
Feed carrots	74	74	70

In the mountain regions the hay harvest was delayed and hindred by frequent rains. On the whole weather was favourable to the vegetation throughout the country, except some regions of French-Switzerland, which were affected by drought. Also for permanent and rotation meadows, crop conditions is considered as better than a month ago. In spite of this fact, except the rotation meadows, which are in good condition, the yield of aftermath will be, in regard to quantity below average. The old permanent meadows show lack of glover and they are nearly everywhere infested by hard grasses. The yield of the rotation meadows in good condition (medley and alfalfa) is superior to that of the permanent meadows. In the regions, where aftermath was harvested in good time, the yield was also excellent in quality. Alpages have suffered rather heavily owing to lack of rains.

On August 1, the condition of natural meadows (according to the system of the country) was 73 as on July 1, 1942, against 66 on August 1, 1941. The corresponding figures for rotation meadows are: 79, 79, 73.

Argentina: Prolonged drought during the last two months caused serious damage to pastures.

LIVESTOCK AND DERIVATIVES

PIGS IN DENMARK *).

(Thousand head)

Classification	1942 July 11	1942 June 13	1942 May 2	1942 March 21	1942 Feb. 7	1941 Dec. 27	1941 Nov. 15	1941 Oct. 4	1941 Aug. 23	1941 July 12
Boars for breeding	9	8	8	8	8	9	9	10	11	11
Sows in farrow for first time	61	48	37	27	20	23	28	44	57	78
Other sows in farrow	64	63	61	60	67	69	68	79	86	85
Sows in milk	30	31	32	30	34	42	50	59	61	53
Sows not yet covered (and not for slaughter)	13	14	13	19	20	22	27	24	22	17
Sows for slaughter	4	5	5	9	11	16	21	18	10	7
Total sows	*172*	*161*	*148*	*145*	*152*	*172*	*194*	*224*	*236*	*240*
Sucking pigs not weaned	253	251	256	229	246	326	398	494	515	440
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg.	286	283	270	329	409	513	534	524	462	420
Pigs of 35 and under 60 kg.	295	257	276	327	387	424	416	401	399	405
Fat pigs of 60 kg. and over	191	194	204	229	266	247	374	360	317	254
Total pigs	*1,206*	*1,154*	*1,162*	*1,267*	*1,468*	*1,691*	*1,925*	*2,013*	*1,940*	*1,770*

*) Rural districts only.

CATTLE AND PIGS IN SWITZERLAND BY APRIL 21, 1942.

Last year, the stocks and importation of forage from abroad underwent a new decrease. Area to meadows at the same time, was slowly decreasing nearly in proportion to the increase of areas destined to crops. Besides, the second crop was lower than in 1940. Yields of hay, on the contrary, were more satisfactory than the year before, both as regards quantity and quality. Within a certain measure, it was even possible to reduce the big gaps caused by the blockade and the difficulties of transportation in the imports of forage by increasing the area to fodder cereals (an increase of 17,300 ha. as compared with 1940), by the rational utilisation of waste of bread-making cereals, potatoes and vegetables (whose areas were also increased) and by the more frequent system of intermediate and subsidiary crops. The improving of the methods of fodder storing and artificial drying of grass made up in part for the decrease of the production of home-grown forages, and consequently a considerable improvement in the balance of forage production resulted thereby.

All these efforts, however, made it possible to make up only in part for the gaps in forage imports. And this is the reason why the supply of fodder commodities remained very precarious. It is true that obligatory sales of additional stocks were still considerable last year. But these sales did always take into due account the problem of the evolution of fodder supply. In order to maintain the size of their sales, the amount of their milk production and for other reasons, livestock owners made every effort to keep their animals as long as possible. This was due also, among other things, to the heavy demand of " bétail de rente ". In the present condition of fodder supply in Switzerland, this method of production necessarily carries with it a cosiderable reduction of rations at the and of winter and for as long as green fodder is not available. Cattle, whose feeding has been diminished during a certain period of time, at the beginning of summer must be fed for a longer period with highly nutritive grass. Moreover, at the time of green fodder, farmers try to take advantage of the maximum possibilities of milk production by cows that cleaved at the end of Winter. All these circumstances, mostly due to war, the fluctuation of prices and of the demand for cattle pasturing in the Alps, explain the momentary decrease of the supply of butchery animals during the Spring and the exploitation of larger areas for green forages. Necessarily, all this has an influence on the stock of dry fodder for next Winter, so that it may be stated that this Fall there will be some sales. It is probable, however, that owing to the slowing down of the growth of grass, by the beginning of midsummer the demand may become greater.

Owing to the fact that slaughterings in 1941, except for pigs, were above the exceptionally high level of 1940, the meat stock last year was still comparatively abundant: – at the expenses of home livestock, naturally. Now, in order to reduce consumption within the limits of present production, some restrictions had to be imposed: meat was rationed and slaughterings were limited.

* * *

The comparatively large number of slaughterings as a consequence of the difficulties caused by the war in the provisioning of alimentary and forage commodities, has carried with it in Switzerland a new rather heavy reduction of cattle numbers.

It is worth insisting on the fact that the decrease was of 91,600 head (i. e., 5.8 per cent) on a total of 1,584,100. Out of this number, 7,000 head go on the account of extraordinary losses (poisoning due to military activities in the canton of Uri). In the Spring, Switzerland possessed 38,000 fewer head of cattle than in 1918. It is true that the number of cattle owners decreased by about 20,000 during the last 25 years, mostly on account of the turning of agricultural land into building lots. Moreover, as far as cattle is concerned, the possibilities to procure forages are not as easy as in the case of pigs. Conditions now are worse than during the last world war, because the extension of crops is done chiefly at the expense of meadow lands.

It would seem that a decrease in weight should correspond to the numerical decrease of cattle head.

If Switzerland today has still at her disposal 37,000 cows more than in 1918, she naturally lacks a corresponding amount of oxen and heifers. Considering that Switzerland to day must provide food for about 400,000 more people than during the last world war, the recent conditions of the amount of cattle make it necessary that the strictest measures be taken in the interest of the country's revictualling and of national livestock as well. Fortunately the heavy decrease of cattle is compensated, in a large measure, by a bigger production of pigs.

Cattle (number).

Classification	1942	1941	1940	(1) 1939	1938	1937
Calves not over 6 months:						
for slaughter	31,488	49,332	56,744	57,800	53,854	51,775
for rearing	181,588	167,374	208,889	204,200	209,886	216,060
Young cattle from 6 months to 1 year	97,905	109,586	116,701	112,700	116,882	117,603
Heifers:						
from 1 to 2 years	190,186	216,420	217,543	223,500	224,918	201,443
over 2 years	120,518	124,649	127,244	130,800	124,702	107,034
Cows	823,719	862,742	910,005	926,400	912,516	893,004
Bulls:						
from 1 to 2 years	20,647	23,602	25,582	24,800	25,906	24,232
over 2 years	7,896	7,921	9,208	9,900	8,458	7,774
Oxen:						
from 1 to 2 years	18,543	13,842	13,611	13,200	16,039	12,419
over 2 years		8,618	9,105	7,700	7,424	6,404
Total	1,492,490	1,584,086	1,694,632	1,711,000	1,700,585	1,637,748

(1) The estimate of the total number for Switzerland is based on the differences in the numbers in the cantons covered by the census.

The decrease of cattle has taken place in nearly all the cantons of the plateau in equal proportions, and half of it is due to slaughterings of existing livestock. The other half is the consequence of the decrease in the number of head raised. Its heavy diminution in 1940/41 (a diminution of 20 per cent of veals for rearing) is now evidenced by a considerable reduction of the stock of heifers. In absolute and relative importance, we find that the category that was specially hit, was that from 1 to 2 years old (12 per cent). Its number amounts now to 190,200 head and is the smallest in the last ten years.

Considering the available stocks in 1941, the number of cows should have changed but little. As however slaughterings, partly on account of the lack of forage, were all the time considerably above the average for the last ten years, there was a new reduction of 39,000 head, in round figures, or 4.5 per cent. In spite of this, the share of cows (823,700) in the total number of cattle is still proportionately high. This fact contributes to explain the peculiarities of the livestock for butchery market last Spring.

The stock of calves may keep at a satisfactory level this year also: to the advantage of milk production. Thanks to the good number of heifers last year,

the decrease in the number of older heifers kept within narrow limits (4,100, or 3.3 per cent). There is still a surplus of 120,500 heifers of over two years old, which means that the stock is slightly above the average registered in the last ten years. Beginning with the new year, on the contrary, gaps will be quite noticeable. Consequently the number of milch cows, – no account being taken of fodder supply, – may be maintained at the present level only if slaughterings of cows decrease and the animals are kept longer. The scarcity of " bétail de rente » should last until the end of 1944, because, side by side with the regression in the raising of the youngest heifers, that of young livestock between 6 months and 1 year old not only continued, but became still worse, and this category has gone down to a minimum level in the last ten years (97,900 head, i. e., a decrease of 10.7 per cent). It may be admitted, however, that the minimum level has been attained. Following the very severe restrictions in breeding, livestock is showing a certain wholesome improvement the evolution of which is naturally dependent on future fodder supplies. The increase of the number of veals for rearing is quite evident, because it amounts to 14,200 out of a total of 167,300 head in 1941. As compared with last year reduction (41,500 head), the recovery is still a modest one, as the number which has been reached again, is hardly the same as the minima for the last ten years, but it should be sufficient, if sown acreages should still be increased. As a stimulant to breeding, it may be said that the strong rise in the price of livestock has been of the greatest importance. The fact that the increase of cultivated areas gives some good hope for an increase in forage production, as well as the restrictions on veal fattening and the general fluctuation of prices, have also acted as good stimulant factors. Meat rationing, which hit particularly the veal market, may have hastened the increase of rearings. The order to slaughter veals that are not destined to rearing, and all the other factors that we have just mentioned, explain the strong decrease of veals for slaughter. This decrease amounts to at least 36 per cent, and it very nearly corresponds to the increase of slaughterings which amounted to 31,500 or a little over one half of the average for the last ten years. Yet the total number of veals has not diminished much. But the big increase in the number of veals this year requires an increase in the production of milk as compared with last year.

In this connection, it is worth remarking that the increase in breedings is especially concentrated in the zones that, in the past, did not practice rearing much.

It must be noticed that, at the present stage of rearings, the capacity of cattle reproduction is not great. This situation, therefore, will last rather long: until the time, at least, when the amount of available cattle will be enough to meet normal sales and the supplementary reduction due to the war. If however, the increase of the acreage to be destined to crops should attain the maxima levels of the established plan, there would certainly follow a further decrease in the number of cattle. Whether these decreases are caused by increased slaughterings or simply by restrictions of rearings, the result will always be a considerable reduction of the meat supply during next year. Quality selection on ac-

count of the reduction of the number of head is momentarily more advantageous to milk than to meat production.

As regards bulls, owing to breeding restrictions, the biggest loss is registered in the category of young animals. There has been a further reduction of 20,650 head in the category of bulls from 1 to 2 years old, i. e., 2,950 or 12.5 per cent less than last year. Older bulls are practically as well represented this year as in 1941 (7,900 head).

Cattle.

Classification	Total number		Increase (+) or decrease (—)	
	1942	1941	Absolute data	% (1941 = 100)
Calves not over 6 months:				
for slaughter	31,488	49,332	— 17,844	— 36.2
for rearing	181,588	167,374	+ 14,214	+ 8.5
Young cattle from 6 months to 1 year	97,905	109,586	— 11,681	— 10.7
Heifers:				
from 1 to 2 years	190,186	216,420	— 26,234	— 12.1
over 2 years	120,518	124,649	— 4,131	— 3.3
Cows	823,719	862,742	— 39,023	— 4.5
Bulls:				
from 1 to 2 years	20,647	23,602	— 2,955	— 12.5
over 2 years	7,896	7,921	— 25	— 0.3
Oxen:				
from 1 to 2 years	18,543	13,842	— 3,917	— 17.5
over 2 years		8,618		
Total	1,492,490	1,584,086	— 91,596	— 5.8

Notwithstanding the growing need for draft animals, the number of oxen has fallen considerably below last year. The two age categories together register 18,500 (i. e., 3,900 or 17.5 per cent) head less than in 1941.

* * *

The 12.1 per cent decrease in the total number of pigs, in spite of the increase of the number of pigs raisers, interests especially pig fattening, for which farmers, before the war, made large purchases of forages from abroad. This decrease, however, is far less serious than last year. Acreage increases, and especially those of areas sown to potatoes, mean a bigger amount of waste which will be used for a rational feeding of pigs.

The present total of 670,100 head is still somewhat above the limit allowed by the production of home-grown fodder as proved by the earnest demand that available forages be properly distributed, and is by 300,000 head higher than in 1918. On the other hand, the reduction, since 1940, reached 30 per cent, and we must not be deceived by the general total, because today it includes a com-

paratively high number of young animals that will not be ready for slaughtering before 6 to 10 months.

The strong reduction which has been noticeable in pig raising since the time of the limited census of November 1941, was the immediate consequence of the weak demand for young pigs and of a heavy pressure on their prices due to a decrease of fattening and of the general number of pigs. The small production of young pigs at that time, on the other hand, was the cause of the heavy reduction which, since 1941, has been registered in the number of pigs for fattening and porkers of a more advanced age. For the time being, the 158,900 pigs for fattening that were registered by the 1942 census, represent a minimum which is 12.4 per cent below the figure of last year. Yet, as compared with the decrease of animals of a lower age, that of this category may still be condidered quite modest. If young pigs from 4 to 6 months old were reduced by 19.5 per cent on a total of 217,700, and if the number of young pigs from 2 to 4 months old decreased by about 26,8 per cent on a total of 162.800, it means that pig breeders started raising pigs again only during the winter months of 1941 under the influence of the price increase that was registered at that time for young pigs. Young pigs for fattening are represented by smaller figures than porkers from 4 to 6 months old. This is why the supply of pork in the next weeks and also at the beginning of the coming Winter must be considered as quite precarious and above all, rather irregular.

Pigs (number).

CLASSIFICATION	1942	1941	1940	(1) 1939	1938	1937
Young pigs up to 2 months	159,934	141,053	219,649	203,700	229,711	242,085
sucking pigs	(131,764)	(106,324)	(160,106)	(141,900)	(167,948)	(177,306)
other (weaned)	(28,170)	(34,729)	(59,543)	(61,800)	(61,703)	(64,779)
Young pigs from 2 to 6 months	294,348	380,489	456,453	420,400	434,986	437,374
from 4 to 6 months	(175,270)	(217,705)	(240,248)	(203,000)	(207 720)	(209,594)
Pigs for fattening over 6 months	158.894	181,407	204,250	180,800	183.579	178,405
Sows	54.516	57,209	75,077	72,000	71,531	74,609
in farrow	(32,196)	(37,262)	(43,406)	(51,300)	(47.889)	(52,523)
in farrow for the first time	—	—	—	(19,200)	(17,088)	(18,065)
others	—	—	—	(32,100)	(30,801)	(34,458)
not in farrow	(22,320)	(19,947)	(31,671)	(20,700)	(23,642)	(22,086)
Boars	2,452	2,582	3,242	3,100	3,000	3.155
TOTAL	670,144	762,740	958,671	880,000	922,807	935,628

(1) The estimate of the total number for Switzerland is based on the differences in the numbers in the cantons covered by the census.

The number of pigs destined to rearing was subject to a further reduction since April 1941. After that date, pig raising has been more regular. Under the influence of the rise of prices of porkers and also owing to the belief that young pigs would not be found in the Spring of 1942, the numbers of raisings were completed with the beginning of the new year and made use of, in a large measure,

for the rearing of porkers. This is why the number of sows (54,500 head) is only by 2,700 head less than last year in April, but once more slightly above the number registered in the month of November 1941.

Pigs.

Classification	Total number		Increase (+) or decrease (—)	
	1942	1941	Absolute data	% (1941 = 100)
Young pigs up to 2 months	159,934	141,053	+ 18,881	+ 13.4
sucking pigs	(131,764)	(106,324)	+ 25,440	+ 23.9
other (weaned)	(28,170)	(34,729)	— 6,559	— 18.9
Young pigs from 2 to 6 months	294,348	380,489	— 86,141	— 22.6
from 4 to 6 months	(175,270)	(217,705)	— 42,514	— 19.5
Pigs for fattening over 6 months	158,894	181,407	— 22,513	— 12.4
Sows	54,516	57,209	— 2,693	— 4.7
in farrow	(32,196)	(37,262)	— 5,066	— 13.6
not in farrow	(22,320)	(19,947)	+ 2,373	+ 11.9
Boars	2,452	2,582	— 130	— 5.0
Total	670,144	762,740	— 92,596	— 12.1

This year, however, the breeding period may be shortened. The census, in fact, registered only 32,200 sows in farrow (i. e., 5,070, or 13.6 per cent less than in 1941), while the number of milking sows amounted to 2.370 on a total of 19,950. The production of young pigs, therefore, was but slightly different from the minimum of last year. This year, Switzerland has 131,800 or 23.9 per cent, more sucking pigs than last year. On the contrary, the number of weaned pigs fell by 6,500 head below the number of 1941. By taking into account the number of sows that are still in farrow, the production of porkers should not be much below the needs of the country. In some cantons, pig raising has evidently gone up to a proportion that is quite above the plan for the whole of Switzerland. It is quite possible that the stoppage which has been noticeable in the last few weeks in the rising of prices for young pigs, must not be attributed only to the fact that high prices discourage buyers, but also to the fact that demand has increased. It is naturally difficult to estimate the practical limit of rearings, especially when thousands of holdings are involved. As the possibilities of sales are still more limited than those of rearings, the prices of pigs, in war times, are subject to greater fluctuations than usual. In the setting of prices for young pigs, interventions are difficult, because they depend, above all, on the variations of the prices of forage and then on the yield of fattening pigs.

The heavier situation of breedings and the difference in the production purposes in the different cantons, help also to understand the causes of the differences of pig numbers in them. The characteristics of the most recent modifications are: the little importance of decreases and increases in the breeding regions, a little reduction in the zones where breeders aim chiefly at insuring their own supply and a big regression in the production for the market.

LIVESTOCK IN PORTUGAL.

In the following Table are indicated the figures of livestock and poultry according to the census of December 31, 1940. These figures were compared with those of the census of 1934 and refer to the total of the continent and islands.

Classification	Census December 31, 1940	Census December 31, 1934
Horses	85,040	90,330
Asses	245,448	274,997
Mules and Hinnies	122.832	121.799
Cattle	973.226	905.197
Sheep	3.948.320	3.273.952
Goats	1,243,890	1,296,281
Pigs	1,252,975	1,206,013
Fowls	5,806,790	6,233,411
Ducks	138,461	114,031
Turkeys	136,533	133,112
Pigeons	657,889	846,319
Rabbits	1,043,892	1,007,390

LIVESTOCK IN THE UNITED STATES.

Preliminary estimates of the numbers of livestock on farms in the United States on January 1, 1942, as compiled by the Department of Agriculture, are reproduced below together with the figures for the preceding three years and the averages of the ten years 1930 to 1939.

Number of Livestock on Farms on January 1.

	1942	1941	1940	1939	Average 1930-39
			(Thousand head)		
Horses	9,856	10,214	10,602	10,815	12,083
Mules	3,811	3,922	4,309	4,384	4,868
Cattle, total	74,607	71,461	68,801	66,789	67,041
Cows and heifers 2 years old and over kept for milk	(26,303)	(25,478)	(25,397)	(25,088)	(25,104)
Sheep	55,979	54,283	54,549	53,783	52,878
Pigs	60,526	54,256	60,207	49,293	50,871
Chickens, 3 months old and over	473,900	422,900	429,042	412,604	424,414
Turkeys	...	7,030	8,567	6,418	5,964

The estimated number of horses, including colts, on farms on January 1, 1942 was 9,856,000, showing a decrease of about 4 per cent. on the previous year. The number of colts under 1 year of age was smaller than a year earlier, indicating a further decline during 1941 in the number of colts foaled.

The number of mules, including colts, was about 3 per cent. smaller.

The number of all cattle reached 74,607,000 head which was 3,146,000 head or 4 per cent. larger than a year earlier, and 7,566,000 head or 11 per cent. above the 10-year (1930-1939) average. Of the increase of 3,146,000 head, 825,000 heads were milk cows the number of which (cows and heifers two years old and over kept for milk) was 26,303,000 head, with an increase of 3 per cent.

The number of hogs on farms was 60,526,000 showing an increase of 6,270,000 head or about 12 per cent. from a year earlier. This number was 19 per cent. larger than the 10-year (1930-1939) average, but this period included the low numbers of the severe drought period.

The number of stock sheep on farms combined with the estimated number of sheep and lambs on feed, gives a total of all sheep of 55,979,000 head, i. e., an increase of 1,696,000 head or 3 per cent. on the previous year.

Chickens on farms numbered 473,900,000 birds, which is 12 per cent. larger than a year ago and the 10-year (1930-1939) average.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Bulgaria: The scarcity of fodder for poultry this year has created a very serious situation for the Bulgarian poultry industry. In order to improve the situation the Council of Ministers recently took various measures, among which the most important are: (1) the distribution to farmers at a very low price, of 3,000,000 kg. (6,600,000 lb) of sunflower cake; (2) the prohibition to kill young poultry before October 1, 1942; (3) the order to farmers to keep a fixed number of poultry head in proportion with the size of their agricultural holdings.

Finland: Lately, the production of butter has been considerably increased thanks to heavy deliveries of milk. It has even been possible to store rather large amounts of butter for the coming winter.

CURRENT INFORMATION ON SERICULTURE.

Spain: According to press information, the silk season in Spain has been very good. The production of cocoons in 1942 has been estimated to amount to 1,100,000 lb., against almost 880,000 lb., in 1941 and 660,000 lb. in 1940. The quality of cocoons is good.

France: The quality of cocoons during the 1942 season has been good. Quantity has not been above last year.

Italy: According to press information, the quantity of cocoons delivered to collective storage plants by December 1941 (sericultural season 1941-42) amounted to nearly 60 million lb. The yield of cocoons per oz. of incubating seed was 125 lb. against 149 lb. per oz. in 1940.

According to conclusive information published at the end of July, it may be said that the amount of incubating grains was rather small. The production of cocoons appears good in Northeastern Italy and in Piedmont, but rather poor in Lombardy, Southern Italy, and Sicily.

Japan: The total production of fresh cocoons is estimated this year at 485 million lb. against 578 millions in 1941 and an average of 699 millions during the period 1936-1940. Percentages: 84.0 and 69.4.

Turkey: The cocoon production in the 1942 season is estimated at about 6.6 million lb cocoons against 4.4 millions in 1941.

TRADE

PORTUGAL

Products and Units	May				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1942	1941	1942	1941	1942 or 1941-42	1941 or 1940-41	1942 or 1941-42	1941 or 1940-41	1941 or 1940-41	1941 or 1940-41
Wheat: 1,000 centals	0	0	564	0	0	0	2,472	1,986	0	2,251
» : Thous. bush. of 60 lb.	0	0	939	0	0	0	4,120	3,311	0	3,752
Wheat flour: 1,000 centals	0	0	0	1	4	0	10	16	0	18
Wheat flour: Thous. bbl. of 196 lb. . .	0	0	0	1	2	0	5	8	0	9
Maize: 1,000 centals.	0	0	41	256	0	2	815	825	9	1,742
» : Thous. bush. of 56 lb.	0	0	74	457	0	4	1,455	1,473	17	3,111
Rice: 1,000 centals .	0	0	0	3	0	0	6	4	38	86
» : Thous. bush. of 45 lb.	0	0	0	7	0	0	13	9	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	11	0	11
» : Thous. bush. of 56 lb.	0	0	0	0	0	0	0	19	0	19
Cotton: 1,000 centals	0	0	42	76	0	0	442	372	0	427
» : Thous. bales of 478 lb.	0	0	9	16	0	0	93	78	0	89
Wool: 1,000 lb. . .	0	0	9	26	0	0	807	181	0	7,086
Butter: » » . .	2	62	0	0	95	137	0	0	313	0
Cheese: » » . .	51	37	0	4	159	139	0	29	317	37
Cacao: » » . .	0	0	4	225	4	0	1,025	1,526	119	2,597
Tea: » » . .	—	—	18	68	—	—	326	401	—	492
Coffee: » » . .	2	223	256	1.490	282	3,038	6,867	14,817	3,305	15,413

SWEDEN: Imports.

Products and Units		May		Total from the beginning of the season *)		Total of the season *)
		1942	1941	1941-42	1940-41	1940-41
Wheat.	1,000 centals	210	0	296	277	277
	Thous. bush. of 60 lb.	349	0	493	461	461
Rye	1,000 centals	75	0	283	835	835
	Thous. bush. of 56 lb.	133	0	505	1,491	1,491
Oats	1,000 centals	110	0	163	171	695
	Thous. bush. of 32 lb.	344	0	511	535	2,172

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao; November 1st for maize.

ARGENTINA: Exports

During the five months ending May 31, 1942; Argentine cereal exports amounted to 28,632,191 centals; flour and bran 366,015 centals; and wool 106,108,842 lb.

BRAZIL: Exports

During the four months ending April 30, 1942; Brazil cotton exports amounted to 1,136,176 centals (216,773 bales of 478 lb); cacao 617,296 centals; and coffee 4,365,167 centals.

CHILE: Wool exports

Wool exports from Chile in the month of June 1942 has been of 3,723,620 lb.

PERU: Exports

Products and Units		Three Months (January 1st-March 31st)	
		1942	1941
Rice	1,000 centals	74	0
»	Thous. bush. of 45 lb.	164	0
Cotton	1,000 centals	150	457
»	Thous. bales of 478 lb.	31	96
Wool	1,000 lb.	1,519	2,840
Coffee	1,000 lb.	600	1,448

URUGUAY: Exports

Products and Units		Twelve Months (January 1st-Dec. 31st)	
		1941	1940
Linseed	1,000 centals	1,742	2,227
»	Thous. bush of 56 lb.	3,110	3,976
Wool	1,000 lb.	97,004	121,255

PORTUGUESE GUINEA.

Products and Units	January 1942	January 1941	Total from the beginning of the season *) 1942	Total from the beginning of the season *) 1941	Total of the season *) 1941 or 1941-40
Imports.					
Wheat flour . . . 1,000 centals	0	0	2	0	1
» » . . . Thous. bbl. of 196 lb.	0	0	1	0	1
Butter . . . 1,000 lb.	4	2	4	2	24
Cheese . . . » »	0	0	0	0	15
Exports.					
Rice . . . 1,000 centals	1	3	1	3	115
» . . . Thous. bush. of 45 lb.	2	6	2	6	256

MOZAMBIQUE

Products and Units	November 1941	November 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.					
Wheat flour . . . 1,000 centals	7	15	65	46	149
» » . . . Thous. bbl. of 196 lb.	4	8	33	24	76
Rice . . . 1,000 centals	24	10	163	120	125
» . . . Thous. bush. of 45 lb.	54	22	363	266	278
Butter . . . 1,000 lb.	40	46	595	540	611
Cheese . . . » »	9	20	205	181	198
Coffee . . . » »	71	20	260	...	...
Exports.					
Tea . . . 1,000 lb.	42	29	192	...	...

ANGOLA

Products and Units	October 1941	October 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.					
Butter . . . 1,000 lb.	4	2	24	26	33
Cheese . . . » »	4	7	60	75	93
Exports.					
Rice . . . 1,000 centals	20	1	44	23	25
» . . . Thous. bush. of 45 lb.	44	2	98	52	55
Coffee . . . 1,000 lb.	7,774	3,036	11,720	5,979	17,174

*) See note page 273.

TIMOR AND CAMBING

Products and Units	September 1941	September 1940	Total from the beginneng of the season *) 1941	Total from the beginneng of the season *) 1940	Total of the season *) 1940-01 1940-41
Imports.					
Wheat flour . . . 1,000 centals	0	0	0	0	2
» . . . Thous. bbl. of 196 lb.	0	0	0	0	1
Exports.					
Coffee . . . 1,000 lb.	370	4	1,060	13	1,784

PORTUGUESE INDIA

Products and Units	August 1941	August 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940-01 1940-41
Imports.					
Wheat . . . 1,000 centals	8	6	8	6	67
» . . . Thous. bush. of 60 lb.	13	10	13	10	112
Wheat flour . . . 1,000 centals	7	3	7	3	42
» » . . . Thous. bbl. of 196 lb.	3	2	3	2	22
Maize . . . 1,000 centals	3	2	17	13	15
» . . . Thous. bush. of 56 lb.	5	4	31	22	26
Rice . . . 1,000 centals	52	41	383	358	543
» . . . Thous. bush. of 45 lb.	116	90	850	797	1,208
Butter . . . 1,000 lb.	35	37	236	231	337
Tea . . . » »	4	4	9	7	106

*) See note pag. 275.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	July 10, 1942	July 3, 1942	June 27, 1942	June 20, 1942	Monthly averages: June 1942	July 1941	July 1940	July 1939	July 1938 *
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery July	80 5/8	80 1/8	80 3/8	80 5/8	80 5/8	77 1/2	72 1/8	61 1/8	104 1/8
„ October	90	90	—	—	—	—	75	62 1/4	83 3/8
„ December	—	—	—	—	—	—	76 1/4	63 3/4	81 3/4
Chicago (cents. p. 60 lb):									
delivery July	120 1/8	117 5/8	115 7/8	119 1/8	117 3/4	102	78 3/4	73	74 7/8
„ September	123 1/8	120 1/4	118 7/8	121 5/8	120 3/8	103 1/2	79 3/4	73 5/8	76
„ December	126 7/8	123 5/8	122	125	* 123 5/8	105 1/8	80 1/8	74 7/8	77 1/8
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery July	56 5/8	54 7/8	54 1/2	56 5/8	55 7/8	58 3/4	45 3/8	44 7/8	53 3/8
„ October	58 1/4	57	56 5/8	58 1/8	57 3/8	56 1/4	43 7/8	45 3/4	53 5/8
„ December	—	—	—	—	—	55 7/8	43 1/4	45 1/8	—
Chicago (cents p. 56 lb.):									
delivery July	67 1/8	64 3/8	63 1/8	65 3/4	64 5/8	57	42 3/8	48 7/8	53
„ September	70 1/4	67 3/8	66	68 1/4	67 1/8	58 1/4	44 1/8	50 5/8	51 3/4
„ December	74 3/8	71 3/8	70	72 1/2	71 3/8	60 7/8	46 1/4	52 1/2	53 3/8
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery July	64 3/4	64 3/4	64 3/4	64 1/4	64 3/4	50 5/8	34 7/8	37 7/8	55 1/8
„ October	61 7/8	63	63 1/8	63 3/8	63 3/8	45 7/8	35 1/8	37 5/8	49 1/8
„ December	—	—	—	—	—	45	35 3/8	37 3/4	47 1/8
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery July	51 1/8	51 1/8	51 1/8	51 1/2	51 1/2	38 5/8	30 3/8	29 1/8	45
„ October	48 5/8	49 3/8	49 1/8	49 7/8	49 5/8	35 1/4	28 1/4	29 1/8	37 1/8
„ December	46 7/8	47 1/4	47 5/8	48	47 3/4	33 7/8	27 1/8	28 3/4	34 1/4
Chicago (cents p. 32 lb.):									
delivery July	47 7/8	46 1/2	47	48 1/8	48	36 1/2	32	33	26 3/4
„ September	48 5/8	47 5/8	48	49 1/8	49	37 1/4	30 1/8	31 1/8	26 1/4
„ December	51 1/8	50 1/4	50 5/8	51 3/4	51 1/4	38 1/2	30 3/8	32 5/8	27 3/8
Maize.									
Chicago (cents p. 56 lb.):									
delivery July	86 7/8	86 1/2	85 3/8	86 3/4	86 1/8	73 3/8	62 1/8	49 5/8	57 1/8
„ September	89 1/4	89 1/4	88 3/4	89 1/8	88 5/8	75 3/8	60 1/8	50 7/8	58 5/8
„ December	92 1/4	92 1/4	91 3/4	91 7/8	* 91 1/4	77 5/8	58 1/4	51 3/4	57 1/8
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery July	164	164	164	164	164	153 1/2	144 1/8	144 1/8	142 3/4
„ October	164	164	164	164	164	150 3/4	148 1/8	141	143

* Indicates that the product was not quoted during part of the period under review.

Quotation for future delivery (*continued*).

Description	August 14, 1942	August 7, 1942	July 31, 1942	July 24, 1942	July 17, 1942	Monthly averages: July 1942	August 1941	August 1940	August 1939	August 1938
Wheat.										
Winnipeg (cents p. 60 lb.):										
delivery July	—	—	81 1/4	81	80 3/4	80 3/4	—	—	—	—
„ October	90	90	90	90	90	90	74 5/8	73 5/8	53 3/8	68 7/8
„ December	—	—	—	—	—	—	76 1/8	74 5/8	55	68 3/4
Chicago (cents. p. 60 lb.):										
delivery July	—	—	—	—	116 1/2	* 118 1/8	—	—	—	—
„ September	118 1/4	117 3/8	116 5/8	118 5/8	118 5/8	119 3/8	111 1/4	72 1/8	65 5/8	63 1/8
„ December	121	120 5/8	119 5/8	121 7/8	121 3/8	122 3/8	114 3/4	73 3/8	65 5/8	65 5/8
„ May 1943	125	124 3/4	123 1/2	122 1/4	126 3/4	* 124 1/8	117 5/8	74 7/8	66 1/4	67 7/8
Rye.										
Winnipeg (cents p. 56 lb.):										
delivery July	—	—	54 7/8	55 3/8	54 3/4	55 1/4	—	—	—	—
„ October	54 3/8	54 3/4	55 1/2	57 5/8	56 1/4	56 7/8	55 3/8	42 1/8	37 3/8	41
„ December	55 3/4	—	—	—	—	—	56 1/4	43 1/4	38 3/8	41 3/4
Chicago (cents p. 56 lb.):										
delivery July	—	—	—	—	65 3/4	* 65 7/8	—	—	—	—
„ September	64	65 1/4	66 3/8	67 1/8	68 1/8	67 7/8	67 3/4	39 3/8	40 1/4	48 3/8
„ December	68 1/4	69 5/8	70 1/4	71 3/8	72 1/8	71 7/8	71 5/8	42 3/8	42 1/8	48 1/4
„ May 1943	74	74 7/8	75 1/8	77	77 3/4	* 76 3/4	76	45 3/8	44 3/8	45 7/8
Barley.										
Winnipeg (cents p. 48 lb.):										
delivery July	—	—	60	64	64 3/4	63 3/8	—	—	—	—
„ October	61 1/8	60 7/8	60 3/4	61 1/4	61 1/8	61 5/8	50 3/4	33 3/8	34 5/8	39
„ December	60 3/4	60 3/4	60 3/4	61 1/4	61	* 61	50 1/4	32 7/8	33 7/8	39 1/4
Oats.										
Winnipeg (cents p. 34 lb.):										
delivery July	—	—	—	51 1/8	51 1/8	* 51 1/8	—	—	—	—
„ October	46 3/4	46	46 3/4	47 1/8	47	47 3/4	43 1/8	28 3/4	27 7/8	31 1/4
„ December	46	45 3/4	46 5/8	46 3/8	46	46 3/8	40 7/8	26 7/8	27 1/4	29 3/8
Chicago (cents p. 32 lb.):										
delivery July	—	—	—	—	47 1/2	* 47 1/4	—	—	—	—
„ September	49 1/4	50 1/8	50 1/4	48 7/8	47 3/4	48 5/8	42 1/8	28 3/4	28 5/8	23 1/8
„ December	50 3/4	51 3/4	52 1/8	51 1/8	50 1/4	51	45 1/4	29	28 1/4	24
„ May 1943	53	54	54 1/8	54 1/4	52 5/8	* 53 3/8	47	29 7/8	28 7/8	25 3/8
Maize.										
Chicago (cents p. 56 lb.):										
delivery July	—	—	—	—	87 7/8	* 87 1/8	—	—	—	—
„ September	85 3/4	87 1/4	88 7/8	90	90	89 1/8	77 3/8	60 3/4	43	52 5/8
„ December	87 3/4	90 1/8	91 1/2	93	93 1/4	92 5/8	81	56 1/8	42 5/8	49 7/8
„ May 1943	91 3/4	94 1/4	95 1/2	97 1/8	98	* 97	84 1/8	57 1/8	45 5/8	52 1/8
Linseed.										
Winnipeg (cents p. 56 lb.):										
delivery July	—	—	164	164	164	164	—	—	—	—
„ October	164	164	164	164	164	164	144 1/8	133 5/8	131 5/8	141 3/4

* Indicates that the product was not quoted during part of the period under review.

APPENDIX

DISTRIBUTION OF PIGS ACCORDING TO AGE, SEX AND DESTINATION

by Valentino Dore

This paper deals with the question of pigs classification in livestock statistics. It is one of the papers of the series devoted to the study of some particular aspects of the problem of the improvement and unification of agricultural statistics, aiming at preparing a preliminary base for the discussions and decisions which official statisticians of the countries interested may be called to undertake and reach, as soon as circumstances will allow.

1. — Livestock statistics in many countries contain more or less complete details on the distribution of pigs according to age, sex and destination.

We are now going to see how far these details lend themselves to a re-grouping according to the minimum classification indicated in the Standard Form for the World Agricultural Census, and to international comparisons.

2. — But, before taking up the question of classifications, we think it useful to deal with a preliminary problem which affects also the comparison of figures of the different countries, viz., the problem of the dates of statistical surveys.

When dealing with species like the porcine, in whose case physiological, climatic and economic factors cause some more or less regular seasonal variations in the number and composition of the amounts, the results of statistical surveys effectuated at different periods of the year, are not rigorously comparable. From an international point of view, the ideal solution would be that all countries gather livestock statistics at the same time. But this solution is not realizable, as the choice of the date of livestock statistical surveys is actually subordinated, in each country, to practical considerations and to circumstances that vary in each case.

For this reason, the Conference of Agricultural Statisticians, charged with the task of preparing the World Agricultural Census, when framing the Census Standard Form, did not think it suitable to recommend that all countries gather their census statistics at a certain definite time of the year. The Census programme contains only the following recommandations: 'As the census period will differ from country to country, it would be very useful to make possible the comparison of certain elements subject to appreciable seasonal variations, e. g., livestock numbers, labour, etc., and it is recommended that, for elements of this kind, each country should indicate whether the returns where secured at a maximum or minimum period, or at an intermediate period. This is particularly important for livestock, and it is even desirable that, for this subject, there should be two enumerations, one at the maximum and the other at the minimum period; in default of this, an estimate might be made of the maximum and minimum numbers on the basis of the returns collected'.

As a matter of fact, in so far as the porcine species is concerned, a few years hence, some countries started to secure several returns in the course of the year. It is thus possible, for this species, to obtain indications on the measure in which the difference of the time at which returns were obtained, can actually alter the value of international comparisons.

I. — *Results of Swine enumerations in Winter and in Summer.*

Country	Date	Total number of pigs (thousand)		% of pigs less than 6 months old to total number of pigs	
		Winter [1])	Summer [2])	Winter [1])	Summer [2])
Germany	1935	22,827	20,033	58.5	70.3
	1936	25,892	22,301	62.5	71.0
	1937	23,847	22,725	59.2	70.7
	1938	23,481	20,086	59.3	70.6
Denmark	1935	3,219	3,036	[3]) 72.7	[3]) 71.8
	1936	3,516	3,496	[3]) 72.6	[3]) 71.3
	1937	2,704	3,066	[3]) 70.5	[3]) 72.2
	1938	2,706	2,842	[3]) 68.5	[3]) 73.0
	1939	3,134	3,124	[3]) 70.5	[3]) 72.2
Ireland	1934	799	968	79.8	82.7
	1938	806	959	80.5	83.8
	1939	820	931	80.7	83.7
Czechoslovakia	1935	3,032	2,980	65.4	72.3
	1936	2,745	3,189	63.2	73.2
	1937	3,242	3,900	62.2	73.8
	1938	3,612	3,827	69.3	73.0
Canada	1935	3,970	3,549	65.3	71.5
	1936	4,222	4,145	70.5	74.9
	1937	3,680	3,963	62.4	71.7
	1938	3,569	3,487	65.6	71.6
	1939	4,770	4,294	67.3	73.9

[1]) December (Ireland: January). — [2]) Germany, Ireland and Canada: June; Denmark and Czechoslovakia: July. — [3]) % of pigs under 60 kg to total number of pigs.

Broadly speaking, on the basis of the few statistical elements shown in Table I, the proportion of young animals below six months is bigger when returns are secured in Summer than when they are secured in Winter. As an average, in the years under survey, the relative importance of young pigs as compared with the total, was greater in Summer than in Winter by 18 per cent in Germany, 12 per cent in Czechoslovakia, 10 per cent in Canada and only 4 per cent in Ireland and 2 per cent in Denmark.

These differences are generally important and must be attributed, in a large measure, to seasonal factors.

Comparisons between the returns secured in the different countries at different times, therefore, must be accepted with caution. It would be highly desirable that an ever increasing number of countries should adopt the system of securing at least two returns of pigs numbers each year, one in Summer and the other in Winter.

3. — The Standard Form framed by the two conferences of agricultural statisticians for the study of the programme of the World Agricultural Census which took place in Rome in October 1936 and in December 1937, adopted the following classification for the porcine species:

Pigs less than six months old,

Boars for breeding six months old and over,

Sows for breeding six months old and over.

The six months limit was considered as best responding to the period at which the animals reach their sexual maturity. Thus, only animals over six months old were subdivided into three groups which include, respectively, breeding boars, breeding sows, all other pigs.

The countries that publish pigs statistics, may be subdivided into three groups:

(*a*) Countries that limit themselves to publish the total number of heads. They are numerous; but generally, pig raising in these countries has not much importance.

(*b*) Countries whose headings agree with those of the classification recommended in the Standard Form for the World Agricultural Census, or that lend themselves to re-grouping according to that classification. These countries and the figures relative to them, are shown in Table II. In the same Table have been included also the data of a number of countries that have adopted a lower age than six months as a basis for the subdivision between young animals and adult ones.

(*c*) Countries that have set the difference between young animals and the others by adopting the age limit of 1 year (in some cases, 10, 9, or 8 months) instead of six months. The figures for these countries are shown in Table III.

II. — *Distribution of pigs according to age.*

COUNTRY	Date	Pigs	Boars for breeding	Sows for breeding	All other pigs	Total
		less than 6 months old	6 months old and over			
Germany	Dec. 1937	14,111,694	86,761	1,657,346	7,991,123	23,846,924
Austria	March 1934	2,003,278	36,455	355,501	427,732	2,822,966
Belgium	Dec. 1939	409,642	3,515	112,486	330,285	855,928
Estonia	June 1929	145,044	2,804	32,512	98,720	279,080
Finland	Sept. 1938	302,223	5,356	56,867	166,236	530,682
France	Nov. 1938	3,630,950	39,790	874,800	2,581,180	7,126,720
Ireland	June 1939	779,105	1,798	95,317	54,687	930,907
Italy	March 1930	2,265,098	←	1,052,977	→	3,318,075
Latvia	June 1939	604,100	← 96,900	→	188,800	889,800
Lithuania	Dec. 1939	606,820	←	590,240	→	1,197,060
Luxemburg	Oct. 1939	104,677	522	14,163	35,365	154,727
Poland	Nov. 1927	3,527,328	←	2,806,128	→	6,333,456
Portugal	Dec. 1934	462,302	←	743,711	→	1,206,013
Switzerland	April 1939	624,100	3,100	74,400	180,800	882,400
Czechoslovakia	July 1938	2,794,492	12,366	519,532	500,252	3,826,642
Canada	June 1939	3,173,500	←	1,120,500	→	4,294,000
United States	Jan. 1940	29,002,000	...	9,352,000	(1) 19,958,000	58,312,000
Chile	April 1936	230,782	45,310	97,207	198,190	571,495
New Zealand	Jan. 1939	438,953	←	244,510	→	683,463
		less than 60 kgs	Boars for breeding	Sows for breeding	60 kgs and over	
Denmark	July 1939	2,259,739	17,795	383,269	472,130	3,132,933
Netherlands	May 1939	985,428	4,822	164,501	398,662	1,553,413
		less than 5 months old	5 months old and over			
Scotland	Dec. 1938	193,000	3,100	31,700	52,500	280,300
Northern Ireland	Jan. 1939	420,846	1,609	59,848	83,423	565,726
		less than 4 months old	4 months old and over			
Norway	June 1939	201,302	2,260	45,383	113,008	361,953
U. S. S. R.	Jan. 1935	7,899,300	←	9,216,900	→	(2) 17,116,200
		less than 3 months old	3 months old and over			
Sweden	Sept. 1937	586,260	8,593	132,668	697,414	1,424,935
		less than 2 months old	2 months old and over			
England and Wales	Dec. 1938	842,000	32,000	447,000	2,533,000	3,854,000
Argentina	June 1937	(3) 1,820,247	(4) 177,769	(4) 741,904	(4) 1,153,720	(5) 3,893,640

(1) Including boars for breeding. — (2) Not including 18,000 pigs not specified. — (3) Sucking pigs. (4) Weaned pigs. — (5) Not including 72,305 pigs not specified.

III. — *Distribution of pigs according to age.*

COUNTRY	Date	Pigs	Boars for breeding	Sows for breening	All other pigs	Total
		less than 1 year old	1 year old and over			
Germany	Dec. 1937	21,517,803	51,344	1,282,306	995,471	23,846,924
Spain	Sept. 1939	5,378,800	59,400	483,300	1,020,800	6,942,300
Hungary	Feb.-March 1939	2,789,725	25,608	705,831	364,479	3,885,643
Italy	March 1930	2,763,993	16,282	329,860	207,940	3,318,075
Romania	1938	2,012,483	82,750	706,075	363,263	3,164,571
Yugoslavia	May 1937	1,616,643	56,130	840,387	990,294	3,503,454
Uruguay	May 1937	134,290	22,152	66,273	123,614	346,329
New Zealand	Jan. 1938	567,696	← 115,767 →			683,463
		less than 10 months old	10 months old and over			
Poland	Nov. 1927	4,889,467	40,351	760,679	642,959	6,333,456
Japon	Dec. 1938	732,982	← 407,497 →			1,140,479
		less than 9 months old	9 months old and over			
U. S. S. R.	Jan 1935	13,646,400	178,300	2,793,700	497,800	1) 17,116,200
		less than 8 months old	8 months old and over			
Bulgaria	Dec. 1934	469,318	31,184	94,655	306,819	901,967

1) Not including 18,000 pigs not specified.

4. — On the basis of elements contained in Tables II and III, we have established, in Tables IV and V, the proportion of young and adult pigs in re-

IV a). — *Proportion in % of young pigs and other pigs.*

COUNTRY	Date	Pigs	
		less than 6 months old	6 months old and over
Germany	Dec. 1937	59.2	40.8
Austria	March 1934	71.0	29.0
Belgium	Dec. 1939	47.9	52.1
Denmark	July 1939	1) 72.1	2) 27.9
Estonia	June 1929	52.0	48.0
Finland	Sept. 1938	57.0	43.0
France	Nov. 1938	50.9	49.1
Ireland	June 1939	83.7	16.3
Italy	March 1930	68.3	31.7
Latvia	June 1939	67.9	32.1
Lithuania	Dec. 1939	50.7	49.3
Luxemburg	Oct. 1939	67.7	32.3
Netherlands	May 1939	1) 63.4	2) 36.6
Poland	Nov. 1927	55.7	44.3
Portugal	Dec. 1934	38.3	61.7
Switzerland	April 1939	70.7	29.3
Czechoslovakia	July 1938	73.0	27.0
Canada	June 1939	73.9	26.1
United States	Jan. 1940	49.7	50.3
Chile	April 1936	40.4	59.6
New Zealand	Jan. 1939	64.2	35.8

1) Pigs under 60 kg. — 2) Pigs of 60 kg. and over.

IV b). — *Proportion in % of young pigs ond other pigs.*

Country	Date	Pigs	
		less than 5 months old	5 months old and over
Scotland	Dec. 1938	68.9	31.1
Northern Ireland	Jan. 1939	74.4	25.6
		less than 4 months old	4 months old and over
Norway	June 1939	55.5	44.5
U. S. S. R.	Jan. 1935	46.2	53.8
		less than 3 months old	3 months old and over
Sweden	Sept. 1937	41.1	58.9
		less than 2 months old	2 months old and over
England and Wales	Dec. 1938	21.8	78.2
Argentina	June 1937	1) 46.7	2) 53.3

1) Sucking pigs. — 2) Pigs other than sucking pigs.

lation to the total number of heads. For Germany, Italy and New Zealand, it has been possible to indicate the proportion of both the animals under six months and over six months of age, and of those under 1 year and over 1 year of age.

V. — *Proportion in % of young pigs and other pigs.*

Country	Date	Pigs	
		less than 1 year old	1 year old and over
Germany	Dec. 1937	90.2	9.8
Spain	Sept. 1939	77.5	22.5
Hungary	Febr.-March 1939	71.8	28.2
Italy	March 1930	83.3	16.7
Romania	1938	63.6	36.4
Yugoslavia	May 1937	46.1	53.9
Uruguay	May 1937	38.8	61.2
New Zealand	Jan. 1939	83.1	16.9
		less than 10 months old	10 months old and over
Poland	Nov. 1927	77.2	22.8
Japan	Dec. 1938	64.3	35.7
		less than 9 months old	9 months old and over
U. S. S. R.	Jan. 1935	79.7	20.3
		less than 8 months old	8 months old and over
Bulgaria	Dec. 1934	52.0	48.0

5. — As regards adult animals, Tables VI and VII show the relative importance of sows for breeding, boars for breeding, and other pigs.

It may be remarked that, in some cases, the statistics do not explicitly indicate that the figures of boars and sows refer exclusively to breeding animals. It is probable, besides, that the expressions " boars for breeding " and " sows for breeding " are not interpreted in a uniform manner in all countries, as these expressions may refer either to animals *destined to breeding* (including animals that are not actually employed for this task), or only to those that are already, *effectively employed for breeding.* The doubt about the possibility that interpretations may differ, seems to be confirmed by the figures indicating the proportions between the number of boars and the number of sows in the different countries (Table VIII). In many cases, the differences between these figures seem too big to be justified by the variety of local conditions.

VI. — *Distribution in % of pigs other than young pigs, according to destination.*

COUNTRY	Date	Boars for breeding	Sows for breeding	All other pigs
		6 months old and over		
Germany	Dec. 1937	0.9	17.0	82.1
Austria	March 1934	4.4	43.4	52.2
Belgium	Dec. 1939	0.8	25.2	74.0
Denmark	July 1939	2.0	43.9	54.1
Estonia	June 1929	2.1	24.3	73.6
Finland	Sept. 1938	2.3	24.9	72.8
France	Nov. 1938	1.1	25.0	73.9
Ireland	June 1939	1.2	62.8	36.0
Latvia	June 1939	← 33.9 →		66.1
Luxemburg	Oct. 1939	1.0	28.3	70.7
Netherlands	May 1939	0.8	29.0	70.2
Switzerland	April 1939	1.2	28.8	70.0
Czechoslovakia	July 1938	1.2	50.3	48.5
United States	Jan. 1940	...	31.9	1) 68.1
Chile	Arpil 1936	13.3	28.5	58.2
		5 months old and over		
Scotland	Dec. 1938	3.6	36.3	60.1
Northern Ireland	Jan. 1939	1.1	41.3	57.6
		4 months old and over		
Norway	June 1939	1.4	28.3	70.3
		3 months old and over		
Sweden	Sept. 1937	1.0	15.8	83.2
		2 months old and over		
England and Wales	Dec. 1938	1.1	14.8	84.1
Argentina	June 1937	8.6	35.8	55.6

1) Including boars for breeding.

VII. — *Distribution in % of pigs other than young pigs, according to destination.*

Country	Date	Boars for breedings	Sows for breeding	All other pigs
		1 year old and over		
Germany	Dec. 1937	2.2	55.1	42.7
Spain	Sept. 1939	3.8	30.9	65.3
Hungary	Febr.-March 1939	2.3	64.4	33.3
Italy	March 1930	3.0	59.5	37.5
Romania	1938	7.2	61.3	31.5
Yugoslavia	May 1937	3.0	44.5	52.5
Uruguay	May 1937	10.4	31.3	58.3
		10 months old and over		
Poland	Nov. 1927	2.8	52.7	44.5
		9 months old and over		
U. S. S. R.	Jan. 1935	5.1	80.5	14.4
		8 months old and over		
Bulgaria	Dec. 1934	7.2	21.9	70.9

VIII. — *Number of boars for 100 sows.*

Country	Number of boars	Country	Number of boars
Germany	5.2	Netherlands	2.9
	[1]) 4.0	Poland [3])	5.3
Austria	10.3	Romania [1])	11.7
Belgium	3.1	United Kingdom:	
Bulgaria [2])	32.9	England and Wales	7.2
Denmark	4.6	Scotland	9.8
Spain [1])	12.3	Northern Ireland	2.7
Estonia	8.6	Sweden	6.5
Finland	9.4	Switzerland	4.2
France	4.5	Czechoslovakia	2.4
Hungary [1])	3.6	Yugoslavia [1])	6.7
Ireland	1.9	U. S. S. R. [4])	6.4
Italy [1])	4.9	Argentina	24.0
Luxemburg	3.7	Chile	46.6
Norway	5.0	Uruguay	33.4

[1]) 1 year old and over. — [2]) 8 months old and over. — [3]) 10 months old and over. — [4]) 9 months old and over.

6. — The Standard Form for the World Agricultural Census does not contain any subdivision for the group of pigs under six months. As however a certain number of countries give details which allow of grouping separately sucking pigs and other pigs under six months, we have thought it convenient to assemble the figures relative to them in Table IX, and to indicate also the proportion of the number of the heads of each group as compared with the total number of pigs below six months of age.

IX. — *Distribution of pigs less than 6 months old.*

COUNTRY	Date	Number	%	Number	%
		Pigs les than 3 months old		Pigs 2 to 6 months old	
Germany	Dec. 1937	(1) 4,083,139	(1) 28.9	(2) 10,028,555	(2) 71.1
Finland	Sept. 1938	86,521	28.6	215,702	71.4
Latvia	June 1939	248,700	41.2	355,400	58.8
Luxemburg	Oct. 1939	39,653	37.9	65,024	62.1
Scotland	Dec. 1938	70,700	36.6	(3) 122,300	(3) 63.4
Northern Ireland	Jan. 1939	181,254	43.1	(3) 239,592	(3) 56.9
Switzerland	Avril 1939	203,700	32.6	420,400	67.4
Czechoslovakia	July 1938	(1) 942,836	(1) 33.7	(2) 1,851,656	(2) 66.3
		Pigs less than 3 months old		Pigs 3 to 6 months old	
Austria	March 1934	1,011,315	50.5	991,963	49.5
Ireland	June 1939	445,189	57.1	333,916	42.9
		Sucking pigs		Porklets until 60 kgs	
Denmark	July 1939	842,700	37.3	1,417,039	62.7
Netherlands	May 1939	(4) 375,447	(4) 38.1	609,981	61.9

(1) Pigs under 8 weeks old. — (2) Pigs 8 weeks to 6 months old. — (3) Pigs 2 to 5 months old. — (4) Pigs less than 6 weeks old.

7. — In the case of pigs, the question of the unification, from an international viewpoint, of the classifications adopted in livestock statistics, presents bigger difficulties than is the case for other species, owing especially to the differences in breeding methods. These differences, in their turn, are largely connected with the particular purposes which breeders pursue, and with the more or less precocious races employed by them. In a general way, it may be said that in the countries where the chief aim of breeders is the production of fats —in the Danubian countries, for instance—fattening begins later and slaughterings are done at a more advanced age than in the countries where the breeders' main purpose is the production of meat and bacon. Thus, it is at least partially explained why certain countries, in their statistics, have adopted a higher or lower age limit than six months between young and adult pigs.

It is not within our scope to discuss here whether, owing to these different circumstances, the adoption by every country of the classification method indicated in the Standard Form would be such as to insure not only a *formal*, but also a *substantial* unification of their statistics.

This question could only be settled through the help of experts who know well the breeding situation in the most important producing countries. They could suggest complementary and, in some cases, necessary details to better enlighten the breeding characteristics of some countries or group of countries.

The statistical material available at present and contained in this study, seems to lend itself to international comparisons only uncompletely and in an imperfect manner. The conclusions that may be drawn from it are often doubt-

ful, owing to the difference in the periods at which returns were secured, to classification methods which in many cases do not agree, to the uncertainty over the interpretation given in the different countries to the expressions " boars for breeding " and " sows for breeding ".

The collaboration of statisticians and zootechnicians of the different countries seems particularly necessary and desirable for the improvement of this branch of statistics, in which the possibilities of satisfactory international comparisons are at present very limited.

PRODUCTION — LATEST INFORMATION

Argentina: (Telegram of 27 August): The first official estimates of the areas sown to cereals and flax in 1942-43 compared to the figures of last year and of the fiveyear average ending 1940-41, respectively, are reproduced below:

Wheat: 15,815,000 acres; against 18,039,000 acres in 1941-42 and an average of 19,336,000 acres. Percentages: 87.7 and 81.8.

Linseed: 6,091,000 acres, against 6,746,000 acres in 1941-42 and an average of 7,354,000 acres. Percentages: 90.3 and 82.8.

Oats: 3,319,000 acres, against 3,519,000 acres in 1941-42 and an average of 3,757,000 acres. Percentages: 94.3 and 88.3.

Barley: 1,846,000 acres, against 1,972,000 acres in 1941-42 and an average of 1,943,000 acres. Percentages: 93.6 and 95.0.

Rye: 2,412,000 acres, against 2,661,000 acres in 1941-42 and an average of 2,711,000 acres. Percentages: 90.6 and 89.0.

The remarkable reduction noticed especially with wheat and flax, is due almost exclusively to the existance in the country of heavy stocks unsold, deriving from the harvests of the last two years, which, by consequence of war, were sold but in smallest part.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

PRINTING OFFICE CARLO COLOMBO — ROME, AUGUST 31, 1942.

MONTHLY CROP REPORT
AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country : Germany, Bohemia and Moravia (Protectorate); Hungary : 1 = *excellent,* 2 = *good,* 3 = *average,* 4 = *poor,* 5 = *very poor; Finland :* 8 = *very good,* 6 = *above the average,* 5 = *average; France :* 100 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *average,* 30 = *poor; Romania and Sweden :* 5 = *excellent,* 4 = *good,* 3 = *average,* 2 = *poor,* 1 = *very poor; Netherlands :* 90 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *below awerage; Portugal :* 100 = *excellent,* 80 = *good,* 60 = *average,* 40 = *poor,* 20 = *very poor; Switzerland :* 100 = *excellent,* 90 = *very good,* 75 = *good,* 60 = *fairly good,* 50 = *average,* 40 = *rather poor,* 30 = *poor,* 10 = *very poor; U. S. S. R. :* 5 = *good,* 4 = *above the average,* 3 = *average,* 2 = *below average,* 1 = *poor; Canada :* 100 = *crop condition promising a yield equivalent to the average yield of a long series of years; United States :* 100 = *crop condition which promises a normal yield; Egypt :* 100 = *crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed :* 100 = *crop condition which promises a yield equal to the average of the last ten years.*

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

See latest information at page 314

VEGETAL PRODUCTION

OLEAGINOUS CROPS IN EUROPE AND THE ENDEAVOURS MADE TO THEIR DEVELOPMENT

by Ivan GRINENCO.

Under present circumstances, the problem of oil producing crops is of the greatest importance in all countries. Before the war, in order to meet the needs of its own consumption, each country imported large quantities of oleaginous products and vegetal oils.

In this paper, which we hope to follow with others dealing with the U.S.S.R. and North America, it is our aim to show, in a general way, which was the situation of the supply of vegetal oils in Europe (not including the U. S. S. R.) till the breaking of the world war, and to give all the information that we have been able to gather on the efforts accomplished by several countries of the European continent to develop oleaginous crops and increase their production of vegetal oils.

I.

The supply of vegetal oils until the breaking of the World war.

Oleaginous crops and their production in Europe.

After 1870, when the progress of sea transports allowed a large and increasing afflux of oleaginous seeds and fruits from other continents where their production was taking place under more favourable climatic and economic conditions, the cultures of oleaginous plants in Europe have gone through many critical periods.

Owing to the strong competition of exotic products, these cultures which were then represented by a very limited number of kinds (mostly colza, flax and hemp), were subject to considerable reductions in nearly every country. In the last twenty years, however, there has been a new increase of the areas destined to oleaginous crops, which was due, to a great extent, to the introduction into the European continent, of new cultures, such as sunflower, soya, cotton and castor-oil. This development was accompanied by a large increase of the consumption which has made it possible for the European countries to absorb, besides their increased home production, steadily increasing amounts of oleaginous products imported from other continents.

By comparing the average data for the period 1909 to 1913 with those for the years 1935 to 1937, it will be found that European production (equivalent in oil) of oleaginous cultures, the importation of such products and oils, and the consumption of vegetal oils, have increased in about the same proportions, viz., 61, 58 and 59 per cent. respectively (1).

(1) In this article, all the data on production are referring to amounts of oil that can be produced with seeds and oleaginous fruits obtained from the different cultures surveyed. As in the case of the monograph published by the International Institute of Agriculture in 1939, " Oils and Fats: Production and International Trade ", the average equivalent in oils has been calculated at 14 per cent. for soya beans, 15 per cent. for cotton seed, 24 per cent. for hemp seed, 25 per cent. for sunflower and mustard seed, 30 per cent. for un-shelled and 40 per cent. for shelled groundnuts, 33 per cent. for linseed, 35 per cent. for colza and rape seed, 40 per cent. for poppy seed, 42 per cent. for the seeds of castor-oil and 45 per cent. for those of sesame.

In these calculations, no account has been taken of the fact that a part of the seeds produced is not used for the extraction of oil, but rather for seeding and sometimes for other purposes. The oil production of the products surveyed, therefore, is in reality inferior to that resulting from our calculations. As however, owing to the lack of an adequate statistical documentation, we had to overlook oils extracted from such products as maize, the seeds of some cucurbitaceous plants, the seeds of tobacco, the stones of raisins, etc., we are justified in our belief that the actual figures of the total production of oils in Europe are not too different from the figures indicated by us.

Data on trade are also indicated in terms of oil. The quantities of imported or exported oleaginous seeds and fruits have been indicated as oil according to the equivalents mentioned above, to which have

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Table I shows the changes of the acreage sown to oleaginous plants in Europe since the period immediately preceding the first world war and until 1940:

I. — *Area of oleaginous crops in Europe.*

(thousand acres)

Years	Linseed	Hemp (seed)	Cotton (seed)	Colza and rape	Mustard	Sunflower	Poppy	Soya	Groundnuts	Sesame	Castor-oil	Total
Average 1909-1913	*988*	*351*	*49*	*457*	*49*	*15*	*74*	—	*20*	*35*	—	*2,038*
1921	736	306	27	329	49	59	74	—	20	27	—	1,627
1922	796	292	35	326	49	106	74	—	20	25	—	1,723
1923	867	272	37	358	49	203	74	—	20	30	—	1,910
Average 1921-1923	*800*	*290*	*33*	*338*	*49*	*123*	*74*	—	*20*	*27*	—	*1,754*
Average 1924-1928	*1,060*	*259*	*69*	*400*	*42*	*457*	*82*	—	*20*	*54*	*2*	*2,445*
1929	1,107	255	96	329	30	583	59	—	20	67	2	2,548
1930	1,018	272	121	427	32	623	91	—	20	94	—	2,698
1931	808	287	82	437	35	662	106	—	20	99	—	2,536
Average 1929-1931	*979*	*272*	*99*	*398*	*32*	*623*	*86*	—	*20*	*86*	*0*	*2,595*
1932	625	287	94	304	27	586	72	2	22	96	—	2,115
1933	707	289	153	255	30	618	111	5	22	128	—	2,318
1934	855	292	175	445	30	783	136	22	25	124	2	2,889
Average 1932-1934	*729*	*289*	*141*	*334*	*30*	*662*	*106*	*10*	*23*	*116*	*0*	*2,440*
1935	1,107	319	274	741	59	751	89	96	32	91	5	3,564
1936	1,245	339	346	638	42	941	96	138	32	121	25	3,963
1937	1,315	353	395	578	35	976	82	277	25	101	30	4,167
Average 1935-1937	*1,223*	*336*	*339*	*652*	*44*	*890*	*89*	*171*	*30*	*104*	*20*	*3,898*
1938	1,258	368	445	704	35	1,030	104	183	25	91	32	4,275
1939	1,295	378	470	568	32	838	106	321	22	128	42	4,200
1940	...	371	618	...	...	...	...	...	...	...	...	...
Average 1938-1940	...	*372*	*511*	...	...	...	...	...	...	...	...	...

Among the eleven crops registered in the table, which include nearly the whole of oleaginous crops on the European continent, flax, hemp and cotton are grown chiefly for the production of fibers. Owing to the comparatively much higher value of bass, the seeds of these plants are considered of secondary importance. The other eight plants, on the contrary, are grown exclusively for the production of seeds. Colza and rape, mustard and poppy seeds are old European crops, spread all over the whole continent, and especially over the

been added those of 45 per cent. for palm kernels and 63 per cent. for coprah. The figures that were thus obtained, were additioned to those of the quantities imported or exported under the shape of oil.

Finally, data on consumption were calculated by adding to the figures on production (expressed in oil), the figures on trade also expressed in oil.

countries of central Europe. Groundnuts, sesame and cotton have been long grown in Europe, but groundnuts are more common in Spain, sesame and cotton in Greece. Sunflower, soya and castor-oil have been introduced into Europe in comparatively recent times. Owing to their climate requirements, they are found mostly in the southern part of the continent.

The following table, containing the average data of the three year period 1935 to 1937, shows the relative importance of the areas sown to each one of the crops mentioned above:

Crops	acres	% of total
Linseed	1,223	31.4
Sunflower	890	22.8
Colza and rape	652	16.7
Cotton (seed)	339	8.7
Hemp (seed)	336	8.6
Soya	171	4.4
Sesame	104	2.7
Poppy	89	2.3
Mustard	44	1.1
Groundnuts	30	0.8
Castor-oil	20	0.5
Total	3,898	100.0

Flax, sunflower, colza and rape grow over the largest part of the areas sown to herbaceous oleaginous crops (70.9 per cent), while cotton and hemp taken together, cover only 17.3 per cent. and all the other crops about 11.8 per cent. of the total area.

Some remarks seem to be required as regards the changes that have taken place in the acreage of the different crops during the years under survey. The area sown to flax, although it was subject to heavy modifications from one year to the other, in the period 1935 to 1937 was, as an average, about ¼ greater than in the period 1909 to 1913.

The culture of sunflower, which in 1909-1913 covered about 15,000 acres, following a steady and important increase, by the year 1938 had reached and gone beyond 1,000,000 acres. Colza and rape seed crops, among the most ancient in Europe, registered a considerable increase only in 1935; but their acreage was later reduced, and in 1939 and 1940 it was again slightly above that of the period 1909 to 1913. The area to cotton has increased from an average of 49,000 acres during the years 1909—1913 to 618,000 acres in 1940. Changes in the acreage sown to hemp have been of slight importance. On the other hand, the area to soya has increased from hardly 2,000 acres in 1932 to 321,000 acres in 1939. Areas to sesame and especially castor-oil crops have strongly increased in the last ten years, while the area to groundnuts has remained practically stationary.

A study of the total area sown to the different kinds of herbaceous oleaginous crops shows that in the period 1921 to 1923 (viz., in the very first years after the end of the war) it was considerably below the level of the period 1909-1913. After then, the general tendency to an increase has been quite marked, in spite of some decreases registered now and then in some years. Average sown areas in the years 1935 to 1937 were almost double those of the years 1909 to 1913, and the increase still continued in the following years.

The crops that have registered the strongest development (cotton, sunflower, soya, sesame, castor-oil) are all characteristic of rather warm regions. It is quite natural, therefore, that these regions, and especially the Balkan countries and Hungary, should have particularly contributed to the increase of area to herbaceous plants taken as a whole.

II. — *Production of oleaginous crops (equivalent in oil) in Europe.*

(thousand metric tons)

YEARS	Linseed	Hemp (seed)	Cotton (seed)	Colza and rape	Mustard	Sunflowers	Poppy	Soya	Groundnuts	Sesame	Castor-oil	Total	Olive	General total
Average 1909-1913	*67.3*	*12.5*	*1.6*	*79.4*	*6.0*	*1.2*	*8.0*	—	*4.8*	*1.8*	—	*182.6*	*510.0*	*692.6*
1921	43.9	12.2	0.7	32.5	5.0	4.7	8.0	—	6.0	1.3	—	114.3	500.0	614.3
1922	49.8	13.9	1.0	33.9	5.0	11.2	8.0	—	6.0	1.3	—	130.1	684.0	814.1
1923	54.4	13.7	1.3	42.3	5.0	22.0	8.0	—	6.0	1.8	—	154.5	589.0	743.5
Average 1921-1923	*49.4*	*13.3*	*1.0*	*36.2*	*5.0*	*12.6*	*8.0*	—	*6.0*	*1.5*	—	*133.0*	*591.0*	*724.0*
Average 1924-1928	*63.7*	*10.6*	*1.8*	*46.9*	*4.7*	*34.2*	*9.2*	—	*6.9*	*2.2*	—	*180.2*	*658.0*	*838.2*
1929	86.5	13.0	2.1	43.7	3.2	59.7	7.6	—	7.8	2.2	0.4	226.2	1,120.0	1,346.2
1930	66.3	12.5	2.2	53.5	3.5	59.2	9.2	—	8.1	4.0	0.5	219.0	362.0	581.0
1931	49.8	13.7	1.6	49.7	3.5	68.2	10.8	—	5.7	4.9	0.6	208.5	758.0	966.5
Average 1929-1931	*67.5*	*13.1*	*2.0*	*49.0*	*3.4*	*62.4*	*9.2*	—	*7.2*	*3.7*	*0.5*	*217.9*	*746.7*	*964.6*
1932	36.0	11.8	2.5	31.1	2.7	59.7	10.0	0.1	6.0	3.6	1.0	164.5	746.0	910.5
1933	43.6	12.2	3.9	32.9	3.0	67.2	14.8	0.1	6.3	4.9	1.0	189.9	665.0	854.9
1934	53.8	11.8	5.1	49.0	2.7	71.7	12.4	0.3	6.6	4.5	1.5	219.4	689.0	908.4
Average 1932-1934	*44.5*	*11.9*	*3.8*	*37.7*	*2.8*	*66.2*	*12.4*	*0.2*	*6.3*	*4.3*	*1.2*	*191.3*	*700.0*	*891.3*
1935	72.3	13.4	7.5	84.0	4.7	76.0	8.0	4.3	7.2	3.6	1.6	282.6	809.0	1,091.6
1936	84.1	14.6	9.1	90.3	5.0	99.0	11.2	6.2	7.2	7.2	1.7	335.6	653.0	988.6
1937	81.8	15.1	11.1	75.9	4.0	97.2	12.8	11.9	7.5	5.4	2.5	325.2	950.0	1,275.2
Average 1935-1937	*79.4*	*14.4*	*9.2*	*83.4*	*4.6*	*90.7*	*10.7*	*7.5*	*7.3*	*5.4*	*1.9*	*314.5*	*804.0*	*1,118.5*
1938	74.2	15.8	10.2	114.4	3.2	96.0	13.2	8.5	7.5	2.7	2.5	348.2	646.0	994.2
1939	80.8	16.1	11.3	87.5	3.5	100.7	13.0	15.4	7.5	9.0	3.4	348.1	938.0	1,286.1
1940	72.6	15.6	13.2	70.0	4.0	110.0	13.0	20.0	7.5	6.0	3.4	335.3	572.0	907.3
Average 1938-1940	*75.9*	*15.8*	*11.5*	*90.6*	*3.6*	*102.2*	*13.1*	*14.6*	*7.5*	*5.9*	*3.1*	*343.8*	*718.7*	*1,062.5*

As shown by Table II, also the production (in oil) of herbaceous oleaginous crops has heavily increased as compared with the period before the first world war, notwithstanding the fact that naturally the curve of the amounts produced and that of the sown areas do not run parallel. This lack of uniformity in the movement

of the two series can be explained as having been due not only to the influence of seasonable factors on the average yield of each year, but also to the fact that important variations have taken place, in the same period of time, in the relative importance of the different kinds of the oleaginous crops under survey, and that the average yield per acre as well as the contents in oil differ considerably according to the kind of crop. In the three years 1935 to 1937, for instance, the average production per acre, expressed in oil, has shown the following changes according to the kind of crop:

Yields in oil per acre.

Crops	Metric tons
Groundnuts	0.25
Colza and rape	0.13
Poppy	0.12
Mustard	0.11
Sunflower	0.10
Castor-oil	0.10
Linseed	0.06
Sesame	0.05
Soya	0.04
Hemp (seed)	0.04
Cotton (seed)	0.03

For the same reasons, the relative importance of the yield in oil of the different crops is far from coinciding with the relative importance of their acreage, as is shown by the comparison of the figures of the average 1935 to 1937 in the following table with those of the table at page 294.

Production, in oil.

Crops	Thousand metric tons	% as compared with the total
Sunflower	90.7	28.8
Colza and rape	83.4	26.5
Linseed	79.4	25.3
Hemp (seed)	14.4	4.6
Poppy	10.7	3.4
Cotton (seed)	9.2	2.9
Soya	7.5	2.4
Groundnuts	7.3	2.3
Sesame	5.4	1.7
Mustard	4.6	1.5
Castor-oil	1.9	0.6
Total	314.5	100.0

As regards the regional distribution of the production of herbaceous oleaginous crops as a whole, it will be enough to mention here that in these last years about 48 per cent. of the total production of oils has been furnished by the Balkan States and Hungary, about 21 per cent. by the Baltic States and Poland, 21 per cent. by the countries of Central Europe (Germany—including Austria—Czechoslovakia, and Switzerland), 6 per cent. by the countries of North-Western Europe (France, Belgium, the Netherlands and Denmark) and 4 per cent. by the countries of South-Western Europe (Italy, Spain, Portugal). Production in the United Kingdom, Ireland and the Scandinavian countries is practically null.

All the information furnished so far is referable exclusively to herbaceous oleaginous crops, about which it has been deemed useful to insist first and more at length because the acreage sown to these crops, owing to the short period of their vegetative cycle, is susceptible of rather quick variations: that which does not happen in the case of arborescent crops.

But as a matter of fact, in Europe the most important oleaginous crop is represented by the olive tree. According to approximate calculations, this crop covers 10,100,000 acres, viz., an acreage twice and a half larger than that of all the herbaceous oleaginous crops put together. The average yield of the olive crop, in oil, may be estimated at about 0.07 metric ton per acre. The production of olive oil in the years 1938 to 1940 reached, with an average af about 720,000 metric tons, more than double the amounts of all the herbaceous oleagineous crops together (about 345,000 metric tons).

The preeminence of the culture of the olive tree is therefore one of the characteristics of the situation of oleaginous crops in Europe. It also explains the great fluctuations registered from year to year in the total European production of oil, which is largely influenced by the strong yearly variations in the yield of the olive tree.

Yet, in spite of these fluctuations, the total production of both herbaceous and arborescent oleaginous crops has registered a very remarkable increase. In the period 1938 to 1940, in fact, it attained the figure of 1,062.5 thousand metric tons against 696.6 thousand metric tons in the period 1909 to 1913: which means that between the two periods mentioned above the increase was of about 50 per cent.

The amount of imported vegetal oils.

Table III contains, separately for continental and insular Europe, (United Kingdom and Ireland), the figures of surpluses of imports over exports during the three years 1936 to 1938 for the whole of the most important oleaginous seeds and fruits expressed in oil, and of the respective oils. Certain products of secondary importance have been neglected for practical reasons. Among them are the seeds and oils of mustard and perilla, and some other products such as the kernels of babassu, the kernels of karité, their oils and tungoil which are of small importance in the trade of European countries and whose figures, therefore, could not alter to any considerable extent the conclusions that may be drawn from the table.

III. — *Net imports (+) or exports (—) of oleaginous seed and fruits (equivalent in oil) and oils in Europe.*

(Average 1936-1938)

Crops		Continental Europe		United Kingdom and Ireland		Europe (total)
	Thousand metric tons					
a) *Annual herbaceous crops:*						
Groundnuts	+	555.3	+	95.1	+	650.4
Linseed	+	292.3	+	109.5	+	401.8
Soya	+	183.5	+	12.9	+	196.4
Castor-oil	+	35.1	+	12.1	+	47.2
Sesame	+	16.6		0	+	16.6
Colza	+	9.7	+	7.1	+	16.8
Cotton (seed)	+	9.5	+	80.1	+	89.6
Hemp (seed)	+	4.3		0	+	4.3
Sunflower	—	2.8		0	—	2.8
Total	+	*1,103.5*	+	*316.8*	+	*1,420.3*
b) *Tree plantations and exploited natural stands:*						
Coconuts	+	493.3	+	93.9	+	587.2
Oil palm	+	440.5	+	179.4	+	619.9
Olive	—	27.7	+	9.3	—	18.4
Total	+	*906.1*	+	*282.6*	+	*1.188.7*
General total (*a* + *b*)	+	**2,009.6**	+	**599.4**	+	**2,609.0**

During the period surveyed, which shows the situation just on the eve of the world war, total imports, net of exports, of Europe taken as a whole had reached 2,609.0 thousand metric tons, of which 2,009.6, viz., about 3/4, were absorbed by continental Europe and 599.4 by the United Kingdom and Ireland. As a matter of fact, nearly the whole of the latter figure must be attributed to the United Kingdom, because the importations of Ireland are limited to only 3 thousand metric tons.

Both in the case of continental and insular Europe there is a prevalence of imports of products of herbaceous oleaginous crops over that of arborescent ones (1,103.5 thousand metric tons against 906.1 for continental Europe and 316.8 thousand metric tons against 282.6 for insular Europe).

Among the products of herbaceous holeaginous crops imported into continental Europe, the most important share is represented by the seeds and oils of groundnuts, linseed and soya whose total imports amount to 1,031.1 thousand metric tons of oil (about 9/10 of the grand total). Castor-oil, sesame, colza, cotton and hemp contribute to the remainder in almost equal proportions. Sunflower only registers a very small surplus (2,800 metric tons) of exports over imports.

Importations of seeds and oils of linseed, groundnut and cotton into insular Europe amount to 284.7 thousand metric tons of oil and represent about 9/10 of the importations of the production of herbaceous oleaginous crops.

As regards the importations of the products of arborescent crops, the coconut and palm oil have about the same importance in continental Europe, with a slight prevalence of the former. Importations of palm oil into insular Europe amount to about the double of the importations of coconut oil.

Consumption of vegetal oils in Europe and the deficit of production compared with consumption.

In the case of insular Europe, the culture of oleaginous crops is practically inexistent, and imports and consumption coincide. In the case of continental Europe, on the contrary, an indication of consumption may be obtained only by adding the surpluses of its imports expressed in oil, to the amounts of oil which correspond to its production of oleaginous seeds and fruits. The elements of this calculation and its results are shown, for the three years 1936 to 1938, in table IV.

IV. — *Production, net import (+) and export (—) and apparent consumption of oleaginous seeds and fruits (oil equivalent) and oils in continental Europe.*

(Average 1936-1938)

Crops	Production		Net imports (+) or exports (—)	Apparent consumption		% of production as compared with consumption
	thousand metric tons	% of total production	thousand metric tons	thousand metric tons	% of total consumption	
Olive	749.7	69.3	— 27.7	722.0	23.4	103.8
Groundnuts	7.4	0.7	+ 555.3	562.7	18.2	1.3
Coconut	0	0	+ 493.3	493.3	16.0	0
Oil palm	0	0	+ (1) 440.5	(1) 440.5	14.2	0
Linseed	80.0	7.4	+ 292.3	372.3	12.1	21.5
Soya	8.9	0.8	+ 183.5	192.4	6.2	4.6
Colza	93.5	8.6	+ 9.7	103.2	3.3	90.6
Sunflower	97.4	9.0	— 2.8	94.6	3.1	103.0
Castor-oil	2.2	0.2	+ 35.1	37.3	1.2	5.9
Sesame	5.1	0.5	+ 16.6	21.7	0.7	23.5
Cotton (seed)	10.1	0.9	+ 9.5	19.6	0.6	51.5
Hemp (seed)	15.2	1.4	+ 4.3	19.5	0.6	77.9
Poppy	12.4	1.2	0	12.4	0.4	100.0
Total	**1,081.9**	**100.0**	**+ 2,009.6**	**3,091.5**	**100.0**	**35.0**
including:						
Annual herbaceous crops	*332.2*	*30.7*	*+ 1,103.5*	*1,435.7*	*46.4*	*23.1*
Tree plantations and exploited natural stands	*749.7*	*69.3*	*+ 906.1*	*1,655.8*	*53.6*	*45.3*

(1) Including 276.4 thousand metric tons of palm kernel oil and 164.1 thousand of palm oil.

Products are registered in this table, in decrescent order, according to the importance of consumption. Besides absolute figures, have also been indicated, for each quality of oil surveyed, the proportion of production and consumption compared respectively with total production and total consumption, and the proportion, in percentage, of production as compared with consumption.

The total consumption of vegetal oils in continental Europe during the years 1936 to 1938 amounted to 3,091.5 thousand metric tons. 53.6 per cent. of oils consumed were drawn from tree plantations and exploited stands, 46.4 per

cent. from herbaceous crops. Five of the thirteen oleaginous crops surveyed, produced, by themselves alone, 83.9 per cent. of the total amounts of oils consumed, viz., the olive (23.4 per cent.), the groundnut (18.2 per cent.), the coconut (16 per cent.), the oil palm (14.2 per cent.), and linseed (12.1 per cent.).

The production of continental Europe covered 23.1 per cent. of the consumption of oils of herbaceous crops and 46.4 per cent. of the oils of arborescent crops. Taking all the vegetal oils together, the part of consumption covered by production amounted to 35 per cent. In other words, nearly 2/3 of the total amounts consumed in continental Europe had to be imported from other continents, either under the shape of seeds and oleaginous fruits or else transformed into oil. Insular Europe, in its turn, was obliged to import practically the whole of the products necessary for its consumption of vegetal oils.

This situation explains the difficulties which, in a more or less serious measure were met by all the European countries when the war interrupted altogether or nearly so, the importation of oleaginous raw materials and oils from other continents.

In order to get a clear idea of the importance of this deficit, one has only to consider that, during the period 1936-1938, the 332.2 thousand metric tons of oils produced in continental Europe from herbaceous crops (the only ones that lend themselves to a quick developpement) came from an area of 4,136,600 acres. On this basis, in order to get a complementary amount of oils corresponding to the quantities furnished by the importations destined to this part of Europe alone (viz, 2,009.6 thousand metric tons), the area sown to oleaginous crops should be increased by about 25 million acres. Naturally the figure that has been indicated has merely a theoretical value, because the areas needed to produce a certain amount of oil are very different according to the kind of crops and the more or less high yields of each one of them under local conditions. Moreover the circumstances created by the war might suggest a larger use of oleaginous raw materials which, under normal conditions, are not made use of, or are used only in a more limited amount. Lastly, due account must be taken of the fact that all countries have taken measures to reduce the consumption of vegetal oils, often in a very strong proportion.

In any case, it is certain that the problem of the supply of vegetal oils for the needs of alimentation and industry, has raised the lively interest of the Governments of all European countries and has caused, among other things, all sorts of efforts being done almost everywhere to increase the development of oleaginous crops.

On the basis of the documentation that has been possible to gather under present circumstances, will be indicated, in a subsequent part of this study, the measures taken by the different Governments of a number of countries in order to increase the supply of vegetal oils.

(to be continued)

Table I shows the changes of the acreage sown to oleaginous plants in Europe since the period immediately preceding the first world war and until 1940:

I. — *Area of oleaginous crops in Europe.*

(thousand acres)

Years	Linseed	Hemp (seed)	Cotton (seed)	Colza and rape	Mustard	Sunflower	Poppy	Soya	Groundnuts	Sesame	Castor-oil	Total
Average 1909-1913	*988*	*351*	*49*	*457*	*49*	*15*	*74*	—	*20*	*35*	—	*2,038*
1921	736	306	27	329	49	59	74	—	20	27	—	1,627
1922	796	292	35	326	49	106	74	—	20	25	—	1,723
1923	867	272	37	358	49	203	74	—	20	30	—	1,910
Average 1921-1923	*800*	*290*	*33*	*338*	*49*	*123*	*74*	—	*20*	*27*	—	*1,754*
Average 1924-1928	*1,060*	*259*	*69*	*400*	*42*	*457*	*82*	—	*20*	*54*	*2*	*2,445*
1929	1,107	255	96	329	30	583	59	—	20	67	2	2,548
1930	1,018	272	121	427	32	623	91	—	20	94	—	2,698
1931	808	287	82	437	35	662	106	—	20	99	—	2,536
Average 1929-1931	*979*	*272*	*99*	*398*	*32*	*623*	*86*	—	*20*	*86*	*0*	*2,595*
1932	625	287	94	304	27	586	72	2	22	96	—	2,115
1933	707	289	153	255	30	618	111	5	22	128	—	2,318
1934	855	292	175	445	30	783	136	22	25	124	2	2,889
Average 1932-1934	*729*	*289*	*141*	*334*	*30*	*662*	*106*	*10*	*23*	*116*	*0*	*2,440*
1935	1,107	319	274	741	59	751	89	96	32	91	5	3,564
1936	1,245	339	346	638	42	941	96	138	32	121	25	3,963
1937	1,315	353	395	578	35	976	82	277	25	101	30	4,167
Average 1935-1937	*1,223*	*336*	*339*	*652*	*44*	*890*	*89*	*171*	*30*	*104*	*20*	*3,898*
1938	1,258	368	445	704	35	1,030	104	183	25	91	32	4,275
1939	1,295	378	470	568	32	838	106	321	22	128	42	4,200
1940	...	371	618	...	...	...	...	...	...	...	..	...
Average 1938-1940	...	*372*	*511*	...	...	...	...	...	...	...	...	...

Among the eleven crops registered in the table, which include nearly the whole of oleaginous crops on the European continent, flax, hemp and cotton are grown chiefly for the production of fibers. Owing to the comparatively much higher value of bass, the seeds of these plants are considered of secondary importance. The other eight plants, on the contrary, are grown exclusively for the production of seeds. Colza and rape, mustard and poppy seeds are old European crops, spread all over the whole continent, and especially over the

een added those of 45 per cent. for palm kernels and 63 per cent. for coprah. The figures that were hus obtained, were additioned to those of the quantities imported or exported under the shape of oil.

Finally, data on consumption were calculated by adding to the figures on production (expressed in il), the figures on trade also expressed in oil.

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE BARLEY AND OATS.

Germany: The weather has been almost uninterruptedly favourable to the harvesting of cereals. Although, owing to low temperatures and a long-lasting Spring, harvesting began later than ordinarily, it could be completed within the proper time, before the time of potato gathering. By September 12, 97 per cent. of cereals had been stored. Fine weather has also favoured a good ripening of the seeds.

Bulgaria: The acreage sown to cereals this year is bigger than had been fixed by the plan by 31 per cent for barley and 12 per cent for oats. At the beginning of August, cereals harvesting was over and threshing had begun.

Preparations are on for the coming season. The plan for cereal sowings foresees a total area of 5,831,800 acres, of which 4,769,200 acres to wheat, 877,300 to rye and 185,300 acres to other cereals crops.

The Direction for the purchase and exportation of cereals has sent out a circular which orders that all agricultural holdings lacking cereal seeds or having only an insufficient supply, notify the same Direction through the agronomists and ask for the amount of seeds needed. The delivery of the seeds will be done by the agricultural cooperatives, the branches of the Bank of Agriculture, cereal merchants or the agronomists themselves.

Denmark: In the table below is indicated the acreage sown to cereals in 1942 as compared with that of the year 1941 and the average of the five preceding years:

Cereals	1942	1941	Average 1936-40	% 1942: 1941 = 100	% 1942: Average = 100
	(in thousand acres)				
Wheat	14.1	202.0	292.5	6.9	4.8
Rye	470.5	474.0	340.6	99.3	138.1
Barley	1,020.8	929.9	956.7	109.8	106.7
Oats	835.5	845.6	909.5	98.8	91.9
Meslin	761.6	791.7	768.4	96.2	99.1

The conditions of the crops at the 1st of September, as compared with conditions at the 1st of August 1942 and the 1st of September 1941, were as follows: Wheat 79, 78, 72, Rye 93, 91, 78; Barley 103, 101, 78; Oats 100, 97, 74; Meslin 100, 98,74.

Spain: The production of wheat is estimated rather low, but its quality is good. Yields of rye and oats are varied, but they are generally satisfactory.

Finland: Forecasts are for a higher yield than last year.

France: According to press information, damages caused to cereal crops by the cold of the winter were not as heavy as had been feared, and besides the losses which were suffered have been made up for by timely re-seedings in the Spring.

It seems that the increase of acreage this year as compared with last year is weak for wheat, but quite considerable for barley and oats. On the whole, harvest forecasts are satisfactory.

Greece: According to the most recent unofficial information, cereal crops in Thessaly in 1942 have yielded only 1,100,000 centals, against 4,400,000 centals averaged in good years.

Hungary: During the last two weeks of July, the weather was moderately warm. Rainfalls were above average in the western part (over one half) of the country, and below average in the other sections. During the first three weeks of August the weather was rather cool. Towards August 17, wheat harvesting was over everywhere and threshing was on. Yields are quite varied, but the quality of the grains is generally very good. At that date, threshing was over nearly everywhere. Yields of the rye crop are generally lower than had been forecast: its quality too is not very good. Much of it is second or third quality. At the date mentioned above, threshing of winter rye was over, while spring rye was still being threshed. Spring rye has yielded little straw. The harvesting of late oats was still on. The quality of oats is good everywhere in the country.

During the three weeks ending September 12, the weather was very hot and dry everywhere. Over an important part of the country it did not rain at all.

Towards September 12, harvesting and threshing of cereals were over. The quality of cereals is good, but the quantity of straw is small. An exceptionally long drought prevents the beginning of preparatory works for seeding Autumn cereals.

Romania: The long drought in August and in the first part of September severely hindered plowing in view of autumn seedings. The Romanian government took some measures in order to finance autumn sowings this year also; a credit of 1 ½ milliard lei has been opened in favour of the Ministry of Agriculture for the purchase and distribution of selected seeds to farmers. A detailed plan of sowings all over the country and in each department will be put into execution by the farmers under the control of technical and administrative bureaus.

Sweden: Warm weather in the last weeks was favourable to crops which had been heavily damaged by winter cold and low temperature in the Spring.

The area sown to wheat in 1942 is estimated at 689,400 acres against 707,700 in 1941 and 758,500 as an average for the five preceding years: percentages 97.4 and 90.9. Production is estimated at 9,962,700 centals (16,604,200 bush.) against 7,298,600 centals (12,164,100 bushels): percentages 136.5 and 67.2. The corresponding figures for rye are: area 615,300 acres, 510,600 acres, 467,600 acres: percentages 120.5 and 131,6. Production: 9,532,800 centals (17,022,900 bushels), 6,156,300 centals (10,993,400 bushels), 7,583,100 centals (13,541,400 bushels); percentages 154.8 and 125.7.

Canada: According to press reports, wheat surpluses about the middle of the year, were officially estimated at 633 million bushels (380 million centals). This figure would represent a new record. Of this amount, 400 million bushels (240 million centals) are in the hands of the Government, and 233 million bushels (140 million centals) are free. Last year, the surplus stocks amounted to 387 million bushels (232 million centals) and in 1940 to 284 million bushels (170 million centals).

Wheat total production in 1942 is officially estimated at 369,146,000 centals (615,243,000 bushels), against 179,400,000 centals (299,000,000 bushels) in 1941 and an average of 219,774,000 centals (366,290,000 bushels) in the years 1936 to 1940. Percentages: 205.8 and 168.0. The 1942 production is the highest ever obtained in Canada, it being 29 million centals (48 million bushels) above the preceding record production of 1928 which amounted to 340 million centals (567 million bushels). The figure of the production for 1942 is followed, in order of bigness, by the productions of 1940 (331 million centals = 551 million bushels) and 1939 (312 million centals (521 million bushels). The production of the year 1941, on the contrary, was only the seventh, in increasing order, in the twenty years 1922 to 1941. During that period, the two smallest productions were registered in 1937 (108 million centals = 180 million bushels) and in 1936 (132 million centals = 219 million bushels).

With the exception of from 11 to 13 million centals (18 to 22 million bushels) of winter wheat, the whole of the Canadian wheat production is of spring wheat, of which over 9/10 are produced in the Prairie Provinces, Saskatchewan, Alberta and Manitoba.

The very abundant production registered this year is almost entirely due to the exceptional yield, which, at the beginning of August, was estimated at over 16 centals (27 bushels) per acre.

Argentina: After the long drought of late months, rainfalls in August improved the condition of cereals. At the beginning of September, the wheat crop especially was considered to be doing generally well.

Australia: According to press information, the area sown to wheat this year is estimated by the government at 10,520,000 acres, against 12,653,000 last year. The regression of 14 per cent. is relatively small and less important than expected.

CURRENT INFORMATION ON MAIZE.

Bulgaria: The acreage sown to maize this year is by 12 per cent. larger than had been fixed by the plan. In some southern regions, drought seems to have done some damage to the crop.

Spain: Forecasts on maize are generally unfavourable.

Greece: The production of Maize in Thessaly this year appears to be quite good.

Hungary: Towards the end of July the condition of maize was as follows: In the zones where rains were sufficient, the crop was developping well. But in several places rains fell too late and the formation of ears and grains was not perfect. During the night the temperature was exceptionally low, and it was feared that maize could not ripen. In some places rain was needed. The first three weeks in August, however, were favourable to the crop which improved considerably. Towards the 22nd of August it was officially stated that, if the weather was favourable, very little maize would not ripen.

Drought that lasted over the three weeks ending September 12, did not damage early maize, the ears and grains of which had already formed: it only hastened their maturation. Late maize on the contrary was damaged by the want of rain and dew during their critical period, viz., the period of grain formation. It seems that maize will certainly ripen, but there will be numerous cases of white-washing. By the time under consideration, harvesting of early maize (very often white-washed) had begun in many places.

Romania: The long drought in August and in the first half of September damaged the maize crop. Delayed seedings were particularly damaged.

CURRENT INFORMATION ON RICE.

Spain: According to very recent information, the production of rice will be abundant.

China: According to press information the rice crop in China, appears to be exceptionally abundant. Top figures are registered in every part of the country. The price of rice has fallen considerably nearly everywhere in the region of Shanghai and Nanking.

CURRENT INFORMATION ON POTATOES.

Germany: According to press information, the early potato crop is exceptionally abundant and forecasts for the season potato crop are very good.

Bulgaria: The acreage to potatoes this year is three times wider than the average of the last three years and 23 per cent. larger than had been fixed by the plan.

Production forecasts are quite good: 17,637,000 centals (31,495,000 bushels) against 6,614,000 centals (11,811,000 bushels) last year. According to the most recent information, some damage to the crop has been caused by the drought.

Denmark: The area to potatoes in 1942 amounts to 242,900 acres against 180,400 in 1941 and 181,500 as an average for the five preceding years: percentages: 134.7 and 133.8.

The condition of the crop at the 1st September was 96 against 95 at August 1, 1942 and 87 at September 1, 1941.

Spain: The production of potatoes appears to be good. Late rains have improved the condition of the crop.

Finland: At the beginning of August, the condition of the potato crop, expressed in the system of the country, was 5.6 against 5.0 at the corresponding date the year before.

Hungary: The first three weeks of August were favourable to potatoes. In some departments, however, it rained somewhat late and crops that had been badly hit by the drought, could not be saved. Towards September 12, potato harvesting had been started.

The gathering in of late potatoes at the beginning of September, viz., one month in advance, is considered in Hungary as an utterly exceptional fact.

In some places, tubers have dried up.

Sweden: At the beginning of September, the temperature was higher than usual, especially in the southern part of the country. Rainfalls were only about three fourths of normal. Crops were damaged by mildew (Phytophtora infestans). The condition of the potato crop at the 1st September, as expressed in the system of the Institute, was 100 against 105 at the corresponding date last year.

According to press information, the production of potatoes is estimated at 45,141,500 centals (75,234,300 bushels) against 45,659,800 centals (76,098,100 bushels) in 1941 and an average of 42,350,500 centals (70,582,700 bushels) in the five preceding years. Percentages: 98.9 and 106.6.

Switzerland: According to press information, the area sown to potatoes was increased to about 185,300 acres. If yields are as good as present conditions make it probable, the crop may yield over 29,762,500 centals (49,603,200 bushels).

Argentina: According to the most recent estimate, the production of potatoes in 1941-42 amounted to 31,790,800 centals (52,983,600 bushels), i. e., to 36.6 per cent. over the already good one of the year 1940-41 (23,280,900 centals = 38,800,700 bushels). It was also 99.8 per cent. higher than the average production of the five preceding years (15,908,500 centals. = 26,513,700 bushels). As the production of the present season is by far larger than is required to fill the needs of the country, the Government has authorized the exportation of 4,850,200 centals (8,083,500 bushels) to Uruguay. The excellent results registered this year are due to the increase of areas to potatoes, favourable weather and the use of selected seeds.

CURRENT INFORMATION ON SUGAR.

Denmark: The area sown to sugar beets in 1942 amounted to 111,700 acres against: 114,200 in 1941 and an average of 97,000 in the five preceding years. Percentages 97,8 and 115,1.

The condition of the crop at the 1st September was 88 against 87 at the 1st of August 1942 and 95 at the 1st of September 1941.

Results of the weekly analyses of sugarbeets:

WEEK	Average weight of root			Average weight of leaves			Sugar content			Weight of sugar per root		
	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940
	oz.	oz.	oz.	oz.	oz.	oz.	%	%	%	oz.	oz.	oz.
3rd. week of August	7.2	11.4	11.8	16.4	18.8	17.1	12.1	12.3	13.9	0.9	1.4	1.6
4th. week of August	9.7	13.3	(1) 14.1	18.6	19.8	(1) 18.0	12.2	12.9	(1) 14.5	1.2	1.7	(1) 2.0
Last week of August	12.2	15.2	(2) 13.8	20.4	20.5	(2) 15.5	12.1	13.7	(2) 14.9	2.6	2.1	(2) 2.1
1st week of Sept. .	13.7	16.4	15.8	21.0	20.3	16.7	13.1	15.1	15.5	1.8	2.5	2.5
2nd week of Sept. .	14.9	18.1	16.9	21.4	20.0	16.4	14.3	15.6	16.0	2.1	2.8	2.7

(1) Average to four years. — (2) Average to three years.

Spain: Towards the end of August, owing to favourable weather, the conditions of the beet crop had improved.

According to a recent statement of the Association of Sugar Refiners, the sugar beet production of the season 1942-43 is estimated at about 22 million centals (1.1 million sh. tons). From this quantity might be obtained 3.1 million centals (154,300 sh. tons) of raw sugar; but probably a part of the beets produced this year will be destined to the feeding of livestock. It must be noticed also that a production of about 3.3 million centals (165,300 sh. tons) of raw sugar from sugar beets, represents only one half of an average production. The production of raw cane sugar of the 1942-43 crop may be estimated at 183,700 centals (9,200 sh. tons). Here are the complete figures of the sugar season 1941-42 (July 1941-June 1942):

	Centals	Sh. tons
Beets delivered at refineries	23,622,700	1,181,100
Raw sugar obtained from beets	3,549,700	177,500
Sugar cane delivered at refineries	2,028,800	101,400
Raw sugar obtained from sugar cane	192,400	9,600

Hungary: Towards August 22, sugar beets were developping well owing to rain. Up to that date, no serious damages were reported. Late crops also appeared to have improved.

The decree (See 'Industrial Crops') regulating the culture of industrial plants in Hungary makes it obligatory for farmers who had grown sugar beets in the past, to grow them again in 1942/43 on an area at least equal to the biggest sown to this crop in the years 1940/41 and 1941/42.

Drought during the 3 weeks ending September 12, has nearly stopped the development of beets. Gathering of the crop had begun in some places. The sugar contents of the roots are considered high.

Sweden: The condition of the sugar beet crop at the 1st September, as expressed in the system of the Institute, was 97 against 103 at the corresponding date last year.

According to press information, the sugar beet crop would be nearly 10 per cent. lower than last year.

According to press information, the sugar beet crop is estimated at 37,478,700 centals (1,873,900 sh. tons) against 40,646,700 centals (2,032,300 sh. tons) in 1941 and 41,753,300 centals (2,087,600 sh. tons) in the five preceding years: percentages, 92,2 and 89,8.

CURRENT INFORMATION ON VINES.

Germany: According to private information, wine production in Germany this year will be about average.

Bulgaria: According to press information, the condition of vineyards at the beginning of August was considered good.

Spain: The forecast on the production of wine in Spain is generally favourable. Yields appear particularly high in the zones of Tarragone, Zamora, Navarre and Avila. Prolongued drought in summer has prevented the spreading of mildew.

France: Forecasts for a higher production of wine than last year are proving correct. According to private sources, the first estimates foresee a yield of about 1,100 million Imp. gallons (1,321 million American gallons) against a declared crop of 934,9 million Imp. gallons (1,122,7 million American gallons) in 1941 and 985,5 million Imp. gallons (1,183,5 million American gallons) in 1940. Production this year, however, would be considerably below the average.

Hungary: Towards August 22, the condition of vineyards was good.

Warm weather in the three weeks ending September 12, favoured the ripening of grapes. Drought, however, had often dried the grains. Production, therefore, will be lower than had been forecast.

Italy: Vintages are expected to be good nearly everywhere. The prolongued drought has improved the quality of raisins. The production of wine is estimated decidedly higher than in 1941, when it amounted to about 792 millions Imp. gallons (951 millions American gallons).

Portugal: According to press information, wine production in Portugal is estimated average (155-175 millions Imp. gallons – (185-210 millions American gallons).

Romania: After two consecutive years of a very low production, it is forecast that this year wine will be more abundant. In order to obtain wines of one quality and in larger quantities, the Ministry of Agriculture has taken some measures for the collective transformation into wine of a large quantity of raisins. This operation will be accomplished by about 30 wine cooperatives under the direction of specialists of the Ministry of Agriculture.

Serbia: According to press information, the forecast for the production of wine in the wine producing regions of Serbia is quite favourable.

Switzerland: At the beginning of September the condition of vineyards was good and even very good over nearly all the zones of production. Damages caused by unfavourable weather and maladies were of little account.

Algeria: Crop forecasts are still favourable and wine production is estimated only slightly lower than the average of the years 1935 to 1939, which was 374 million Imp. gallons (449 million American gallons).

CURRENT INFORMATION ON OLIVES.

Spain: At the end of August, information from the most important oil producing regions was not favourable. Drought and heavy winds have caused an abundant fall of the fruit.

Greece: According to information from the Ministry of Agriculture, the olive crop for direct consumption of the 1941-42 season in Greece (present frontiers) has amounted to 802,600 centals. The distribution of this production by provinces was as follows: region of Phtiotis-Phokis, 363,800 centals; Larissa, 198,400 centals; Pelopponesus, 60,200 centals; other regions of Greece, 180,200 centals. According to the same source, the 1941-42 production of olive oil amounted to 1,705,900 centals (22,744,200 Am. gallons) for the whole of Greece, of which 507,100 (6,760,800) at Mytilene, 467,400 (6,231,700) at Crete, 331,800 (4,423,900) in the Peloponnesus, 88,200 (1,175,800) in Attica, and 311,400 (4,152,000) in the other regions of the country.

CURRENT INFORMATION ON FLAX.

Bulgaria: The acreage sown to flax this year is by 58 per cent. larger than had been fixed by the plan. According to unofficial information, the drought has done damages to the crop.

France: According to press reports, the area sown to flax in 1942 is estimated to amount to 92,700 acres, against 56,800 last year and 88,800 as an an average from 1936 to 1940. This means an increase of 63 per cent as compared with the acreage of 1941 and 4 per cent as compared with the average. The production of fibre is about 50 per cent higher than last year and its quality remarkably better. The average production of fibre in the years 1936 to 1940 was 514,300 centals.

Hungary: Linseed was rather thin and hindered by weeds. Towards August 22, the harvesting of flax for bast and seed and the threshing of the latter were nearly over. (See also "Industrial Crops").

Italy: Flax seems to have been damaged by unfavourable weather. Excessive rains during seeding and the long drought of the summer, caused rather serious damages in all the zones of production.

Romania: The flax crop this season has been unsatisfactory. Flax for seeds was preferably sown.

Argentina: Rainfalls in August, after a long period of drought, improved the condition of the flax crop all over the country.

CURRENT INFORMATION ON COTTON.

Romania: Cotton reached the ripening stage and towards the middle of September picking had begun. Unit yields are much higher than in 1941.

United States: According to the September report on the production of cotton published by the Department of Agriculture in Washington, the harvested acreage to cotton is estimated at 23,273,000 acres against 22,240,000 acres actually harvested last year and an average of 27,058,000 acres in the five years 1936-1940. Percentages: 104.6 and 86.0. As compared with the figure of the area sown, which by the lst of July

1942 was estimated at 24,005,000 acres, it appears that this year about 3 per cent of sown areas have been abandoned by natural causes. This percentage is about 1 per cent above market forecasts and the average for the ten years 1932-1941. In 1941 the proportion of abandonment amounted to 3.8 per cent against an average of 1.9 per cent.

Production is estimated at present at 67,054,000 centals (14,028,000 bales) of ginned cotton, while last moth it amounted to only 62,546,000 centals (13,085,000 bales). This big increase within a month shows that the general conditions in which the crop grows are even better than had been forecast at the beginning of August.

As compared with production last year, which amounted to 52,465,000 centales (10,976,000 bales) there has been this year an increase of 27.8 per cent, while, as compared to the average for the years 1936-1940, (64.691.200 centals = 13,534,000 bales) the increase is of only 3.7 per cent.

The unit yield is at present estimated at 289 lb. of ginned cotton per acre actually harvested, against 270 lb. at the beginning of last month. The final yield in 1941 was 232 lb. per acre, and the average for the years 1931 to 1940 was 215 lb. per acre. Yields this year, threfore, are about 25 per cent higher than last year and about 35 per cent above average. The figure of this month is the highest ever registered so far in the United States, it being 19.4 lb. larger than the preceding record of 1937.

This year production is the highest since 1930, after those of 1937 (top figure) and 1931.

CURRENT INFORMATION ON HEMP.

Bulgaria: The acreage sown to hemp this year is 11 per cent. larger than had been fixed by the plan.

Hungary: Hemp for seed has developped well. Hemp for flax, although it is sufficiently tufty, appears rather low. Towards August 22, the harvesting of these crops was in full swing. (See also " Industrial Crops ").

Romania: Hemp this year was sown over a greatly increased area. Yields were normal.

CURRENT INFORMATION ON TOBACCO.

Bulgarie: According to press information, the tobacco crop which flowered in July, is growing well.

Croatia: Tobacco production this year is estimated at 20,944,000 lb. against 14,330,000 lb. in 1941.

Hungary: By August 22, the tobacco crop was developping well. The decree (see " Industrial Crops ") regulating the culture of industrial plants in Hungary establishes that the farmers that had grown tobacco in 1941-42 must grow it also in 1942-43 on an area at least equal to that of the year before. Farmers that had grown tobacco during any year whatsoever since 1937-38 are also obliged to grow it in 1942-43 over an area corresponding to the installations for the conservation and preparation of the tobacco available at present. An increase of the area to tobacco in Hungary is, therefore, to be foreseen.

In the 3 weeks ending September 12, the weather was favourable to tobacco harvesting, storing and drying. The quality of the product is good.

Southern Rhodesia: According to press information the production of tobacco in 1941-42 is estimated at 44,300,000 lbs against 36,600,000 lbs in 1940-41 and an average of 25,855,000 lbs in 1935-1936 to 1930-40; percentages, 121.0 and 171.3.

CURRENT INFORMATION ON HOPS.

Hungary: Towards August 22, hops were growing well.

CURRENT INFORMATION ON OTHER PRODUCTS.

Groundnuts.

Italy: According to press information, the flowering of groundnuts was abundant and the yield of the crop is expected to be good.

Colza.

Bulgaria: Owing to the scarcity of fats, the Ministry of Agriculture has decided to considerably increase the acreage sown to oleaginous plants. An extensive and active propaganda has been carried on among farmers to encourage an increase of area sown to colza. Colza seeds have been distributed to the farmers at a low price.

Hungary: Towards the 22nd of August, preparations for seeding were on. Owing to rain, the work is going on under good conditions. (See also " Industrial Crops ").

Towards September 12, the seeding of Autumn colza had begun. In some places seeding was hampered by drought. Owing to the want of humidity, seeds are not sprouting.

Italy: According to press information, yields of the colza crop were satisfactory and the quality of the product is good.

Romania: Drought during the month of August and the first fifteen days of September prevented the sowing of winter colza, which generally takes place during the second half of August.

Soya.

Bulgaria: As compared with recent years the acreage to soya this year shows a considerable increase, but it still remains below the figure set by the plan.

Hungary: Towards August 22, the soya crop was developping well. In some places, husks and seeds are thin on account of the drought. Here and there, the ripening of late cultures was considered uncertain. For its complete development, the crop needs a long and warm Autumn.

Italy: Estimates of the soya crop are favourable.

Sunflower.

Bulgaria: The acreage to sunflower this year was 3 per cent. larger than had been fixed by the plan.

Hungary: Towards August 22, early sunflower crops were growing well. The ripening of late crops, on the contrary, was doubtful. (See also " Industrial Crops").

Towards September 12, sunflower was ripening. The long-lasting drought has worsed forecasts on yields. By that date, picking up operations had begum.

Jute.

India: According to the final report on the jute crop, the area sown to it in 1942 is estimated at 3,292,000 acres against 2,160,000 in 1941 and 3,297,000 as an average for the years 1936 to 1940. This means an increase of 52 per cent as compared with last year, and a decrease of only 0.1 per cent as compared with the average.

The corresponding production is estimated at 36,056,000 centals, against 21,896,000 in 1941 and an average of 37,926,000 during the years 1936-1940. Percentages: 164.7 and 95.1.

According to press reports, it seems that the area to jute will be further reduced.

INDUSTRIAL PLANTS IN HUNGARY.

By the decree No. 4730/1942 M. E. (s. Budapesty Közlöny No. 180 of August 9 1942) the Hungarian Government has again regulated the question of the cultivation of industrial plants. Large statistical changes will certainly take place as regards the acreage and the production of these plants in Hungary. We will therefore very briefly rewiew the chief characteristics of that decree.

Each head of holdings cultivating an area of arable land above 21 acres is obliged to cultivate 7 per cent. of this area to industrial plants as principal crops. The industrial plants taken into consideration are: sunflower, colza, linseed, soya castor-oil plant, flax and hemp for flax and seed.

A very detailed list indicates for each section (*idrás*) or municipality of each department, which are the obligatory industrial crops.

Holdings are subdivided into two categories: *a*) holdings possessing arable land of from 21 acres to 142 acres and b) holdings possessing over 142 acres arable land.

The cultivation of the castor oil plant is not obligatory for holdings of the first category, which however must cultivate other industrial plants over 7 per cent. of their arable land. The second category must cultivate some castor oil plants if the soil and climate are favourable to that crop. In that case, 3 per cent. of the arable land must be sown to castor oil plants and 4 per cent. to other crops officially specified.

In order to intensify the culture of the castor oil plant, each 100 m². sown to this crop above the obligatory quota of 3 per cent., are considered equal to 125 m² of any other industrial culture. The same advantageous calculation is granted farmers who grow castor oil plants on good soil and on the basis of a production contract, even though they are not obliged to cultivate that plant.

In order to facilitate to farmers the choice of the crops, the total or partial substitution of one crop for another is allowed, provided the substitution is based on a production contract, with the exclusion of the castor oil plant. As a substitute for a certain crop (castor oil plants excluded) one may choose one or several crops among those indicated in the decree; or one may choose to grow puppy or camline and perilla as supplementary crops. The value of substitute crops from a legal point of view is as follows:

100 m². of colza are equivalent to 100 m² of the area prescribed by the law; 100 m². sown to any crop whatsoever (excepted be castor oil plant and colza)

countries of central Europe. Groundnuts, sesame and cotton have been long grown in Europe, but groundnuts are more common in Spain, sesame and cotton in Greece. Sunflower, soya and castor-oil have been introduced into Europe in comparatively recent times. Owing to their climate requirements, they are found mostly in the southern part of the continent.

The following table, containing the average data of the three year period 1935 to 1937, shows the relative importance of the areas sown to each one of the crops mentioned above:

Crops	acres	% of total
Linseed	1,223	31.4
Sunflower	890	22.8
Colza and rape	652	16.7
Cotton (seed)	339	8.7
Hemp (seed)	336	8.6
Soya	171	4.4
Sesame	104	2.7
Poppy	89	2.3
Mustard	44	1.1
Groundnuts	30	0.8
Castor-oil	20	0.5
Total	3,898	100.0

Flax, sunflower, colza and rape grow over the largest part of the areas sown to herbaceous oleaginous crops (70.9 per cent), while cotton and hemp taken together, cover only 17.3 per cent. and all the other crops about 11.8 per cent. of the total area.

Some remarks seem to be required as regards the changes that have taken place in the acreage of the different crops during the years under survey. The area sown to flax, although it was subject to heavy modifications from one year to the other, in the period 1935 to 1937 was, as an average, about ¼ greater than in the period 1909 to 1913.

The culture of sunflower, which in 1909-1913 covered about 15,000 acres, following a steady and important increase, by the year 1938 had reached and gone beyond 1,000,000 acres. Colza and rape seed crops, among the most ancient in Europe, registered a considerable increase only in 1935; but their acreage was later reduced, and in 1939 and 1940 it was again slightly above that of the period 1909 to 1913. The area to cotton has increased from an average of 49,000 acres during the years 1909—1913 to 618,000 acres in 1940. Changes in the acreage sown to hemp have been of slight importance. On the other hand, the area to soya has increased from hardly 2,000 acres in 1932 to 321,000 acres in 1939. Areas to sesame and especially castor-oil crops have strongly increased in the last ten years, while the area to groundnuts has remained practically stationary.

are equivalent to 75 m^2., and finally 100 m^2. of supplementary crops (camline and perilla) and of fodder pumpkins (cultivated on one's own land and on the basis of a production contract) are equivalent to only 50 m^2.

If Autumn flax or colza have been destroyed before April 15, they must be substituted with other industrial plants.

Lastly, any industrial crop unmentioned herein, may be grown and legally recognised, provided some regulations of procedure prescribed by the same decree, are observed.

A number of well chosen facilitations for the farmers are also mentioned in the decree. Thus, for instance, the authorities put at the disposal of farmers, under the guise of a loan, the grains for seeding, and grant them fertilizers and concentrated feeds in advance.

The great advantages granted to farmers and the very severe measures taken for the realisation of the plan, make it foresee that in 1943 there will be a remarkable increase of all the industrial crops all over Hungary.

CURRENT INFORMATION ON FODDER CROPS.

Bulgaria: According to unofficial information, the production of hay varies from meagre to average on account of damage caused by the drought. In order to increase the available supply of forages for the civil population, the Government has taken the following measures: it has recommended that farmers cut grass everywhere it is possible to do so, even in the forests, without damaging young forestry plantations, under the direction and the control of forestry authorities. The farmers are obliged to cut the grass in the forest areas indicated by the authorities and to gather the hay, leaves, acorns, straw, stalks of maize and fodder maize, and to deliver them to the authorities. Village mayors are charged with the control and direction of gathering and delivery of forages to the central stations; and, if needs be, they, are authorized to mobilise labour and to organize the drying of maize. All the hay production of natural meadows in the year 1942 is to be put at the disposal of military authorities.

Denmark: The condition of forage crops at the 1st of September as compared with conditions at the 1st of August 1942 and the 1st of September 1941 was as follows: lucerne 96, 93, 94; forage beets, 85, 80,92; forage turnips 94, 88, 95; pastures 83, 72, 81.

Finland: Fodder forecasts are for a lower crop than normal. The quality of green and dry forages is bad. At the beginning of August the condition of the crop of artificial meadows, expressed in the system of the country, was 4.1 against 4.2 at the corresponding date last year.

Hungary: During the first three weeks of August, the weather was generally favourable to forage crops. Towards August 22 the second cut of clover and the third (and even the fourth) of lucerne were going on. Clover on stubble fields was also growing well. Vegetation on natural meadows and pastures had resumed its normal development. Drought which prevailed during the three weeks ending September 12, damaged all forage crops.

Romania: Owing to the drought, fodder production this year is generally low. The competent bureaus of the Ministry of Agriculture advise the farmers to get supple-

mentary forages timely and to use sylos for their preparation and storing. The same Ministry has issued severe instructions aiming at the substantial increase of artificial meadows (lucerne, clover, fodder peas, sorghum, beets, etc.) over pastures.

Sweden: The condition of fodder roots and fodder tubers at the 1st of September as expressed in the system of the country, was 2.9 against 2.0 at the same date last year.

Hay production of artificial meadows in 1942 amounted to 82,036,500 centals (4,101,800 sh. tons) against 46,739,100 centals (2,336,900 short tons) in 1941 and an average of 103,733,700 centals (5,186,600 short tons) in the five preceding years. Percentages: 175.5 and 79.1. The corresponding figures for natural meadows are: 8,487,800 (424,400), 6,722,500 (336,100), 9,639,600 (482,000). Percentages: 126.3 and 88.1.

Argentine: At the beginning of September the condition of pastures was good, owing to August rains.

LIVESTOCK AND DERIVATIVES

HORSES, CATTLE AND POULTRY IN DENMARK *).

(Thousand)

Classification	July 11 1942	March 21 1942	July 12 1941	April 19 1941	March 8 1941	June 29 1940	July 15 1939	July 15 1938
Horses	*596*	*544*	*589*	*540*	—	*575*	*577*	*564*
Colts under 1 year	63	45	58	30	—	53	53	50
Colts from 1 to 3 years	100	78	95	84	—	93	92	88
Stallions 3 years old and over	4	4	4	4	—	4	4	4
Geldings 3 years old and over	193	192	201	197	—	200	203	202
Mares 3 years old and over	236	225	231	225	—	225	225	220
Cattle	*2,865*	*2,831*	*3,014*	*3,068*	*2,976*	*3,226*	*3,271*	*3,186*
Calves under 1 year old	743	679	795	773	803	862	852	834
Bulls 1 year old and over	54	59	58	67	59	64	68	63
Steers	72	70	77	78	66	74	78	80
Heifers 1 year old and over	605	628	622	644	565	635	659	610
Cows and heifers having farrowed	1,391	1,395	1,462	1,506	1,483	1,591	1,614	1,599
Fowls	*11,478*	*5,908*	*13,180*	*8,352*	*8,055*	*24,568*	*29,126*	—
Chicken under 6 months	5,603	—	5,447	347	—	10,676	16,901	—
Cocks 6 months old and over	111	170	109	160	171	161	150	—
Hens 6 months old and over	5,764	5,738	7,624	7,845	7,884	13,731	12,075	—

(*) Rural districts.

PIGS IN DENMARK *).

(Thousand head)

Classification	1942						1941			
	Aug. 22	July 11	June 13	May 2	March 21	Feb. 7	Dec. 27	Nov. 15	Oct. 4	Aug. 23
Boars for breeding . . .	8	9	8	8	8	8	9	9	10	11
Sows in farrow for first time	56	61	48	37	27	20	23	28	44	57
Other sows in farrow .	64	64	63	61	60	67	69	68	79	86
Sows in milk	40	30	31	32	30	34	42	50	59	61
Sows not yet covered (and not for slaughter)	16	13	14	13	19	20	22	27	24	22
Sows for slaughter. . .	5	4	5	5	9	11	16	21	18	10
Total sows . . .	*181*	*172*	*161*	*148*	*145*	*152*	*172*	*194*	*224*	*236*
Sucking pigs not weaned	337	253	251	256	229	246	326	398	494	515
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg.	280	286	283	270	329	409	513	534	524	462
Pigs of 35 and under 60 kg.	305	295	257	276	327	387	424	416	401	399
Fat pigs of 60 kg. and over	272	191	194	204	229	266	247	374	360	317
Total pigs . . .	*1,383*	*1,206*	*1,154*	*1,162*	*1,267*	*1,468*	*1,691*	*1.925*	*2,013*	*1,940*

*) Rural districts only.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Bulgaria: According to press information, the condition of livestock was not satisfactory, owing to the long period of drought which has limited the feed for the animals in the pastures.

According to a new ministerial decree, the slaughtering of all species of fowl of male sex is allowed again, beginning August 15. The killing of all species whatsoever of fowl of the female sex is strictly forbidden.

Switzerland: According to surveys made by the Swiss Peasants'Union, the delivery of milk by 800 milk societies during the month of July averaged 4.6 per cent. less than in July 1941. This result, comparatively advantageous, if the condition of the chaptel is taken into account, must be attributed to the favourable development of forage crops. Figuring at 100 the number of deliveries in July 1939, the deliveries during the same month this year can be figured at 88.

United States: According to press information, the Department of Agriculture estimates provisionally that the production of wool in the United States amounts to about 389,240,000 lb. This is a top figure which is 1 per cent. above that of last year. The increase in the production is to be attributed to the increase of shorn sheep this year as compared with the year before because the production per head has amounted to 7.9 lb., against 8.1 lb. in 1941.

Argentina: The sanitary condition of livestock in August was good.

CURRENT INFORMATION ON SERICULTURE.

Bulgaria: According to press information, the production of cocoons this year is lower than in 1941.

Italy: According to press information, the production of cocoons this year is estimated at about 55 million lb.

Japan: According to a recent estimate the quantity of eggs incubated for spring reerings in 1942 was 1,552,000 ounces against 1,762,000 in 1941 and 2,145,500 on the average of the preceding 5-year period; percentages: 88.1 and 72.3. The corresponding production of cocoons is estimated at about 254 million lb against 311 million in 1941 and 358 million lb in 1936-1940; percentages: 81.8 and 71.1.

PRODUCTION — LATEST INFORMATION

Italy: The "National Consortium of Sugar Refiners" communicates that the production of sugar of the season 1942-1943 may amount to 9,480,000 centals (474,000 sh. tons), against 10,064,000 centals (503,200 sh. tons) in 1941-1942 and an average of 9,613,000 centals (480,600 sh. tons) in the period 1936-1937 to 1940-1941. Percentages: 94.0 and 99.0.

Argentina (telegram of October 1): Weather conditions in the month of September were unfavourable and caused damages to crops in the western part of the cereal regions, to pastures and to livestock. The general condition of wheat varies from average to good; the condition of the flax crop is considered good.

TRADE

GREECE : Imports.

Wheat imports in the month of April 1942 have been 149,320 centals (248,861 bushels of 60 lb.). For the month of March rice imports have been of 1,257 centals (2,792 bushels of 45 lb.) and cotton imports of 1,301 centals (272 bales of 478 lb).

PORTUGAL

Products and Units	July				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1942	1941	1942	1941	1942 or 1941-42	1941 or 1940-41	1942 or 1941-42	1941 or 1940-41	1941 or 1940-41	1941 or 1940-41
Wheat: 1,000 centals	0	0	483	249	0	0	3,117	2,251	—	—
» : Thous. bush. of 60 lb.	0	0	805	415	0	0	5,195	3,752	—	—
Wheat flour: 1,000 centals	0	0	0	2	4	0	10	18	—	—
Wheat flour: Thous. bbl. of 196 lb.	0	0	0	1	2	0	5	9	—	—
Maize: 1,000 centals	0	0	122	196	0	9	1,016	1,234	9	1,742
» : Thous. bush. of 56 lb.	0	0	218	350	0	17	1,814	2,204	17	3,111
Rice: 1,000 centals	0	5	0	22	0	38	9	38	38	86
» : Thous. bush. of 45 lb.	0	11	1	48	0	84	21	85	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	11	—	—
» : Thous. bush. of 56 lb.	0	0	0	0	0	0	0	19	—	—
Cotton: 1,000 centals	0	0	77	33	0	0	586	427	—	—
» : Thous. bales of 478 lb.	0	0	16	7	0	0	123	89	—	—
Wool: 1,000 lb.	0	0	42	0	0	0	873	196	0	204
Butter: » »	46	24	0	0	183	163	0	0	313	0
Cheese: » »	4	53	0	2	212	201	0	37	317	37
Cacao: » »	0	22	0	119	4	84	1,058	1,757	119	2,597
Tea: » »	—	—	11	44	—	—	11	44	—	(1) 397
Coffee: » »	0	97	66	351	0	97	66	351	(1) 284	(1) 9,094

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat, wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao; November 1st for maize.

(1) Season 1941-42.

SWEDEN: Imports.

Products and Units	July 1942	July 1941	Total from the beginning of the season *) 1941-42	Total from the beginning of the season *) 1940-41	Total of the season *) 1940-41
Wheat . . . 1,000 centals	205	0	781	277	—
Thous. bush. of 60 lb.	342	0	1,302	461	—
Rye . . . 1,000 centals	0	0	286	835	—
Thous. bush. of 56 lb.	0	0	511	1,491	—
Oats . . . 1,000 centals	0	25	163	254	—
Thous. bush. of 32 lb.	0	77	511	794	—

CHILE: Imports.

During the three months ending 31 March 1942 tea imports have been of 3,792 centals, cacao imports have been of 10,097 centals; coffee imports have been of 31,636 centals.

PORTUGUESE GUINEA.

Products and Units	March 1942	March 1941	Total from the beginning of the season *) 1942 or 1941-42	Total from the beginning of the season *) 1941 or 1940-41	Total of the season *) 1941 or 1940-41
Imports.					
Wheat flour . . . 1,000 centals	0	0	2	1	1
» » . . . Thous. bbl. of 196 lb.	0	0	1	0	1
Butter . . . 1,000 lb.	0	2	4	9	24
Cheese . . . » »	0	2	0	2	15
Exports.					
Rice . . . 1,000 centals	2	5	6	16	115
» . . . Thous. bush. of 45 lb.	5	12	13	35	256

MOZAMBIQUE

Products and Units	December 1941	December 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.					
Wheat flour . . . 1,000 centals	12	11	77	57	149
» » . . . Thous. bbl. of 196 lb.	6	6	39	29	76
Rice . . . 1,000 centals	13	6	176	125	—
» . . . Thous. bush. of 45 lb.	28	12	391	278	—
Butter . . . 1,000 lb.	53	68	648	611	—
Cheese . . . » »	20	18	225	198	—
Coffee . . . » »	46	35	306	...	...
Exports.					
Tea . . . 1,000 lb.	51	183	240	...	...

*) See note page 315.

ANGOLA (1)

Products and Units		December 1941	December 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Imports.						
Butter	1,000 lb.	13	4	44	33	—
Cheese	» »	4	13	68	93	—
Exports.						
Maize	1,000 centals	223	148	397	313	3,647
»	Thous. bush. of 56 lb.	398	265	709	559	6,513
Rice	1,000 centals	1	1	46	25	—
»	Thous. bush. of 45 lb.	2	2	102	55	—
Coffee	1,000 lb.	381	64	20,660	6,537	17,174

(1) During the six month ending 30 june 1942 Angola coffee exports have been of 262,175 centals.

PORTUGUESE INDIA

Products and Units		October 1941	October 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940-or 1940-41
Imports.						
Wheat	1,000 centals	0	1	10	15	67
»	Thous. bush. of 60 lb.	0	2	16	25	112
Wheat flour	1,000 centals	1	3	8	9	42
» »	Thous. bbl. of 196 lb.	1	1	4	4	22
Maize	1,000 centals	2	1	20	15	—
»	Thous. bush. of 56 lb.	3	1	36	26	—
Rice	1,000 centals	15	54	427	455	543
»	Thous. bush. of 45 lb.	34	121	949	1,012	1,208
Butter	1,000 lb.	35	24	295	287	337
Tea	» »	4	4	22	37	106

SAO TOME AND PRINCIPE ISLANDS.

Products and Units		June 1941	June 1940	Total from the beginning of the season *) 1941 or 1940-41	Total from the beginning of the season *) 1940 or 1939-40	Total of the season *) 1940 or 1939-40
Imports.						
Wheat flour	1,000 centals	0	0	6	6	6
» »	Thous. bush. of 196 lb.	0	0	3	3	3
Maize	1,000 centals	0	0	31	26	37
»	Thous. bush. of 56 lb	0	0	55	47	65
Rice	1,000 centals	0	0	10	7	17
»	Thous. bush. of 45 lb.	0	0	22	15	38
Exports.						
Cacao	1,000 lb.	0	0	3,816	17,324	20,439
Coffee	» »	13	0	251	1,411	—

*) See note pag. 315.

PRICES

THE PRICES OF CEREALS OF THE 1942 CROP

by C. ARRIGO and J. P. VAN AARTSEN

In this article has been gathered all available information concerning the regulation of the prices of the most important cereals of the 1942 crop in the different countries of continental Europe. In some cases information has been given about minor cereals, which interested some definite country. For the time being, this publication deals only with the essential part of the different regulations. As soon as possible, this part will be completed, including also data on other countries, with an article which is to continue those already published in the issues of this Crop Report for the months of January and May 1942.

Germany. — An Order of the Reichskommissar for Prices and the Minister of Agriculture and Food, issued on July 5, 1942, establishes that the rules concerning the regulation of the cereals market as fixed by the Order of June 28, 1941, must remain in force also for the 1942-43 season. The only modification of a certain importance that is worth noticing, regards the system of supplements to basic prices that are granted to the producers of wheat and rye. These are subject to increases and reductions different from last year in amount and periods of time. Moreover, a special " prompt delivery supplement " amounting to 1 RM. per quintal is granted during the three months August-October for wheat, and July-September for rye.

PERIOD	Wheat		Rye		Fodder barley		Fodder oats	
	1942-43	1941-42	1942-43	1941-42	1942-43	1941-42	1942-43 (3)	1941-42 (4)
	RM. per quintal							
July	(1) 19.40	(1) 19.40	19.70	17.70	16.20	16.20	—	—
August	21.40	20.40	19.70	18.70	16.40	16.40	(5) 18.60	(5) 17.80
September	21.40	20.40	19.70	18.70	16.60	16.60	18.70	17.90
October	21.40	20.40	18.90	18.70	16.80	16.80	18.80	18.00
November	20.60	20.40	18.90	18.70	17.00	17.00	18.90	18.10
December	20.60	20.60	19.00	18.90	17.20	17.20	19.00	18.20
January	20.80	20.80	19.10	19.10	17.40	17.40	19.10	18.30
February	21.00	21.00	19.30	19.30	17.60	17.60	19.20	18.40
March	21.00	21.00	19.30	19.30	17.70	17.70	19.30	18.50
April	20.70	20.80	18.40	19.10	17.80	17.80	19.40	18.60
May	20.70	20.80	18.40	18.70	17.90	17.90	19.50	18.70
June	20.60	20.60	18.20	18.70	18.00	18.00	19.60	18.80
July	(2) 20.60	(2) 20.60	—	—	—	—	19.60	18.80
August, 1st-15th	—	—	—	—	—	—	19.60	18.80

(1) As from July 16. — (2) Until July 15. — (3) Including a supplement of 1.50 R.M. per quintal for compulsory delivery to the Army. — (4) Including a supplement of 0.70 RM. per quintal for compulsory delivery to the Army. — (5) As from August 16.

The division of the country into price regions (*Preisgebiete*) having each a different base price for each particular cereal (18,20 to 20.40 RM. per quintal for wheat; 16.50 to 18.70 RM. for rye; 15.20 to 17.20 RM. for fodder barley, and 15.30 to 17.60 RM. for fodder oats), as well as the dates of the beginning of the season (July 1 for rye and fodder barley, July 16 for wheat, August 16 for fodder oats), etc., remain unchanged.

In the table on the preceding page are shown the prices for the region which includes Berlin.

These prices paid to producers are for good quality produce, sound, having an average specific weight and available free at the station nearest to the producer's farm. For cereals of different specific weights such supplements or reductions are calculated as is shown in the following table:

Specific weight	Wheat	Rye	Fodder barley	Fodder oats
Basic weight (kg. per hl.)	75-77	70-72	59-60	46-48
	Supplement or reduction in RM. per quintal			
1 kg. above the base weight	0.15	0.07	0.15	0.10
2 » » » » »	0.30	0.15	0.30	0.20
3 » » » » »	0.40	0.22	0.40	0.30
4 » » » » »	0.40	0.22	0.50	0.40
1 kg. below » » »	—	—	0.10	0.10
2 » » » » »	0.20	0.07	0.20	0.20
3 » » » » »	0.40	0.17	0.30	(1) 0.30
4 » » » » »	0.60	0.32	0.30	(2) 0.40

(1) As from November 11, reduction of 0.35 RM. — (2) As from November 11, reduction of 0.50 RM.

The price fixed for *brewer's barley* is the same as last year, i. e., 20.50 RM. per quintal. However, a supplement of 1 RM. is allowed for deliveries during the months of July, August and September.

Belgium. — The General Secretary of the Ministry of Agriculture and Food and the Commissioner for Prices and Salaries have issued a decree dated June 30, 1942, fixing the producers' sale prices for home-grown cereals of the new crop. These prices are about the same as those of the preceding season; but spring and winter barley are to be considered henceforward, as bread-making cereals; different prices according to times of delivery have been fixed also for them. In the table on the following page prices are given compared with those of the preceding season.

These prices to producers are for cereals of good quality, sound and merchantable, delivered f.o.r. either at the nearest shipping point or at the warehouse of the agreed merchant or manufacturer, in as far as this warehouse is not more distant than the producer's shipping point.

PRODUCTS	1942-1943			1941-1942			
	Up to Oct. 17	Oct. 18-Dec. 12	As from Dec. 13	Up to Oct. 5	Oct. 6-Nov. 30	Dec. 1-Janv. 4	As from Jan. 5
	Francs per quintal						
Wheat	220	210	200	220	210	205	200
Rye	210	200	190	210	200	195	190
Spelt	195	185	175	195	185	180	175
	Up to August 14	As from August 15		The entire season			
Winter and spring barley	205	185		185			
	The entire season						
Oats	180			180			

Bohemia and Moravia. — The regulations concerning the marketing of cereals of the new crop (prices and base quality distribution of supplements, prompt delivery premiums, etc.) are about the same as those in force in the Reich. Prices, including supplements and premiums, are fixed as follows for every product delivered up to the month of January 1943:

PERIOD	Wheat	Rye	Fodder barley	Fodder oats
	Koruna per quintal			
July 1942	—	185	—	—
August ,,	209	185	154	(1) 160
September ,,	209	185	156	154
October ,,	209	177	158	155
November ,,	201	177	160	156
December ,,	201	178	162	157
January 1943	203	179	164	158

(1) As from August 16.

These prices refer to sales at the farm for produce of base specific weight per hectolitre as follows: wheat 75-77 kg., rye 70-72 kg., fodder barley 59-60 kg., and fodder oats 46-48 kg.

The price to be paid to producers for *shelled maize* with 16 per cent. humidity has been fixed at 170 koruna per quintal.

Bulgaria. — The Direction for the Purchase and Exportation of Cereals has fixed the prices which, beginning July 1. 1942 and until June 30, 1943, will be paid producers for the chief cereals of the new harvest, subject to the monopoly regime.

A study of the total area sown to the different kinds of herbaceous oleaginous crops shows that in the period 1921 to 1923 (viz., in the very first years after the end of the war) it was considerably below the level of the period 1909-1913. After then, the general tendency to an increase has been quite marked, in spite of some decreases registered now and then in some years. Average sown areas in the years 1935 to 1937 were almost double those of the years 1909 to 1913, and the increase still continued in the following years.

The crops that have registered the strongest development (cotton, sunflower, soya, sesame, castor-oil) are all characteristic of rather warm regions. It is quite natural, therefore, that these regions, and especially the Balkan countries and Hungary, should have particularly contributed to the increase of area to herbaceous plants taken as a whole.

II. — *Production of oleaginous crops (equivalent in oil) in Europe.*

(thousand metric tons)

Years	Linseed	Hemp (seed)	Cotton (seed)	Colza and rape	Mustard	Sunflowers	Poppy	Soya	Groundnuts	Sesame	Castor-oil	Total	Olive	General total
Average 1909-1913	*67.3*	*12.5*	*1.6*	*79.4*	*6.0*	*1.2*	*8.0*	—	*4.8*	*1.8*	—	*182.6*	*510.0*	*692.6*
1921	43.9	12.2	0.7	32.5	5.0	4.7	8.0	—	6.0	1.3	—	114.3	500.0	614.3
1922	49.8	13.9	1.0	33.9	5.0	11.2	8.0	—	6.0	1.3	—	130.1	684.0	814.1
1923	54.4	13.7	1.3	42.3	5.0	22.0	8.0	—	6.0	1.8	—	154.5	589.0	743.5
Average 1921-1923	*49.4*	*13.3*	*1.0*	*36.2*	*5.0*	*12.6*	*8.0*	—	*6.0*	*1.5*	—	*133.0*	*591.0*	*724.0*
Average 1924 1928	*63.7*	*10.6*	*1.8*	*46.9*	*4.7*	*34.2*	*9.2*	—	*6.9*	*2.2*	—	*180.2*	*658.0*	*838.2*
1929	86.5	13.0	2.1	43.7	3.2	59.7	7.6	—	7.8	2.2	0.4	226.2	1,120.0	1,346.2
1930	66.3	12.5	2.2	53.5	3.5	59.2	9.2	—	8.1	4.0	0.5	219.0	362.0	581.0
1931	49.8	13.7	1.6	49.7	3.5	68.2	10.8	—	5.7	4.9	0.6	208.5	758.0	966.5
Average 1929-1931	*67.5*	*13.1*	*2.0*	*49.0*	*3.4*	*62.4*	*9.2*	—	*7.2*	*3.7*	*0.5*	*217.9*	*746.7*	*964.6*
1932	36.0	11.8	2.5	31.1	2.7	59.7	10.0	0.1	6.0	3.6	1.0	164.5	746.0	910 5
1933	43.6	12.2	3.9	32.9	3.0	67.2	14.8	0.1	6.3	4.9	1.0	189.9	665.0	854.9
1934	53.8	11.8	5.1	49.0	2.7	71.7	12.4	0.3	6.6	4.5	1.5	219.4	689.0	908.4
Average 1932-1934	*44.5*	*11.9*	*3.8*	*37.7*	*2.8*	*66.2*	*12.4*	*0.2*	*6.3*	*4.3*	*1.2*	*191.3*	*700.0*	*891.3*
1935	72.3	13.4	7.5	84.0	4.7	76.0	8.0	4.3	7.2	3.6	1.6	282.6	809.0	1 091.6
1936	84.1	14.6	9.1	90.3	5.0	99.0	11.2	6.2	7.2	7.2	1.7	335.6	653.0	988.6
1937	81.8	15.1	11.1	75.9	4.0	97.2	12.8	11.9	7.5	5.4	2.5	325.2	950.0	1.275.2
Average 1935-1937	*79.4*	*14.4*	*9.2*	*83.4*	*4.6*	*90.7*	*10.7*	*7.5*	*7.3*	*5.4*	*1.9*	*314.5*	*804.0*	*1,118.5*
1938	74.2	15.8	10.2	114.4	3.2	96.0	13.2	8.5	7.5	2.7	2.5	348.2	646.0	994.2
1939	80.8	16.1	11.3	87.5	3.5	100.7	13.0	15.4	7.5	9.0	3.4	348.1	938.0	1,286.1
1940	72.6	15.6	13.2	70.0	4.0	110.0	13.0	20.0	7.5	6.0	3.4	335.3	572.0	907.3
Average 1938-1940	*75.9*	*15.8*	*11.5*	*90.6*	*3.6*	*102.2*	*13.1*	*14.6*	*7.5*	*5.9*	*3.1*	*343.8*	*718.7*	*1,062.5*

As shown by Table II, also the production (in oil) of herbaceous oleaginous crops has heavily increased as compared with the period before the first world war, notwithstanding the fact that naturally the curve of the amounts produced and that of the sown areas do not run parallel. This lack of uniformity in the movement

These prices are applicable to merchandise delivered at the warehouses of the Direction or to authorized mills. We are giving below these prices compared with those that were in force during the preceding season.

Products		1942-43	1941-42
		Levas per quintal	
Wheat, current quality, 76 kg. per hl.	(1)	620	620
Hard wheat, 77 kg. per hl.	(1)	630	630
White wheat, 76 kg. per hl	(1)	630	630
Rye, 71 kg. per hl.	(1)	530	520
Barley, current quality		420	380
Two-rowed barley		450	410
Oats		420	400
Millet		530	650

(1) For deliveries f.o.b. Varna, Bourgas, Roussé, Denvia, Cervenberg, Skoplie, Bitolia, Swischton, Lom, Vidin and Oreschov: 20 levas more per quintal; for deliveries f.o.b. Jambol and Sliven: 10 levas more.

For wheat and rye increases or reductions of 1/2 per cent over or below the base prices have been calculated for each kg. over or below the specific weight than indicated above.

Producers of *maize* will receive 460 levas per quintal (against 400 last year) for shelled maize, naturally dried, of the new crop. The amount of the prompt delivery premium which in 1941 had been set at 20 levas per quintal up to November, has been raised to 30 levas, always for the September-October period.

Croatia. — The Ministry of Commerce has fixed as follows the prices that will be paid free at the producer's warehouse, for cereals of the new season and stocks of the last:

Wheat,	72 kg. per hl., 5 per cent impurities	420 kunas per quintal
»	73-76 kg. per hl., 2 per cent impurities	430 » » »
»	77 and over kg. per hl., 1 per cent impurities	450 » » »
Rye	according to quality	420 to 450 kunas
Barley	58-62 kg. per hl., 2-3 per cent impurities	475 kunas per quintal
	63-66 kg. per hl., 2-3 per cent impurities	500 » » »
	67-70 kg. per hl., 2-3 per cent impurities	550 » » »
Spelt, millet, and *buckwheat*		450 » » »

A prompt delivery premium of 450 kunas per quintal will be granted for cereales delivered before September 30, 1942.

Denmark. — A ministerial decree, dated July 9, 1942, promulgated according to the law N° 139 of March 3, 1942 and to the law N° 406 of August 3, 1940, fixes the prices of cereals of the 1942 crop. These prices refer to quantities the delivery of which is obligatory and to products of good quality, sound, well cleaned,

sufficiently dry and unmixed, f. o. r. at station or port nearest the warehouse of an authorized merchant. No change in these prices has been made from last year; they are as follows:

Wheat, specifc weight 128 Dutch pounds . . .	28	crowns	per	quintal
Rye, specific weight 118 Dutch pounds	29	»	»	»
Barley, specific weight 112 Dutch pounds . . .	25	»	»	»
Oats, specific weight 85 Dutch pounds	25	»	»	»
Meslin of barley and oats	25	»	»	»

These prices are raised 0,15 crowns per quintal for each kg. the specific weight above that indicated. The maximum increase however, must not be over 0,45 crowns. The price of meslin can never be above 25 crowns. Reductions are calculated for cereals that are mixed or infected by disease.

Spain. — By two Orders, promulgated on April 11 and May 30, 1942, the Head of the Government established the entering into force of the base prices and of the regulation relative to it, which the Minister of Agriculture had fixed for cereals and pulse for seeds harvested in 1942. These prices are valid from June 1, 1942, to May 31, 1943 (formerly the agricultural season lasted from the 1st of July to the 30th of June of each year) for purchases made by the National Wheat Office that this year also has the market monopoly.

The base prices of cereals for sound, dry and well cleaned merchandise, in bulk, f.o.r. warehouses of the National Wheat Office in the places indicated for each product, are as follows:

Products	Delivery point	1942-43	1941-42
		Pesetas per quintal	
Wheat, type "Arévalo" and similar half-soft wheat, specific weight 77 kg., with at maximum 3 per cent impurities	Valladolid	84.00	84.00
Rye	Léon	77.00	70.00
Fodder barley	Valladolid	60.00	51.50
Oats, current quality	Sevilla	55.50	48.50
Maize, current quality, 2 per cent impurities	,,	77.00	70.00
Millet	,,	61.00	52.00
Sorghum	,,	61 00	62.00

These prices are subject to increases and reductions according to the different commercial varieties and quality, due account being taken of the regions of production. The price of wheat, with less than 1 per cent. impurities is augmented by 1,50 pesetas per quintal. The increase is 0,50 peseta for wheat with less than 2 per cent and more than 1 per cent. impurities; lastly, the price of wheat with more than 3 per cent. and but less than 6 per cent. impurities is subject to a reduction, as compared with the base price, in proportion with its percentage of impurity.

The National Wheat Office will pay a premium of 10 pesetas per quintal for all wheat delivered before January 1, 1943 in the provinces of Andalusia, Estre-

madura, Murcia, Alicante or Valencia, and before February 1, 1943 in the other provinces.

Moreover, in order to encourage and increase the production of wheat, the Minister of Agriculture has been authorised to grant other premiums amounting from 10 to 30 pesetas per quintal, taking into account the unit yields obtained by each producer.

Finland. — Following a resolution of the Council of Ministers, passed on April 27, 1942, the State Bureau of Foods will buy also this year all amounts of cereals, edible peas and potatoes of the 1942 crop, which will be offered by producers.

Prices shown in the table below, compared with those of last year, are to be paid producers for mechandise of base quality, f. o. r. wagon at station of departure or other place of delivery established by the Bureau.

Products	1942-43	1941-42
	Finmarks per quintal	
Spring wheat, 76.1-80.0 kg. per hl., 16.1-16.5 degrees of humidity	440	350
Winter wheat, 75.1-78.0 » » » »	410	340
Riye, 66.1-72.0 » » » »	395	340
Barley, 60.1-65.0 » » » »	380	(1) 310-330
Oats, 50.1-52.0 » » » »	300	—
Fodder oats, 42.1-46.0 » » » »	270	260

(1) According to the regions of origin.

Increases and reductions depending upon specific weight and percentage of humidity, are provided for each product.

Cereals produced in the recently recovered regions or in Lapland and the province of Oulu (Uleaborg), will be paid 10 per cent. more than the fixed base price.

France. — A law promulgated on June 30, 1942, fixes as follows the prices of cereals of the new crop, sound, fair and merchan table, prcduced in the Metropolitan territory:

wheat, soft, 73 ½ to 74 ½ kg. per hl.	375	francs per quintal
rye, 68 ½ to 69 ½ kg. per hl.	306	» » »
winter barley, 67 ½ to 68 ½ kg. per hl.	290	» » »
spring barley, 62 ½ to 63 ½ kg. per hl.	285	» » »
oats, grey or black, 47 ½ to 48 ½ kg. per hl. .	269	» » »
oats, white, yellow or all shades, 44 ½ to 45 ½ kg. per hl.	263	» » »
buckwheat, white, 63 ½ to 64 ½ kg. per hl. . .	338	» » »
maize, white or yellow	351	» » »
maize, red	356	» » »

These prices refer to sales at the farm. In case of specific weights different from those indicated for each one of the products mentioned above increases or reductions are given. As regards *wheat*, the price is increased by 0.50 franc for each ½ kg. above that specific weight indicated, up to a maximum of 79 kg. or reduced by the same amount for each ½ kg. when the specific weight is below that indicated, up to a minimum of 71 kg. Special regulations deal with specific weights higher or lower than this maximum or minimum, respectively, For wheat, a maximum percentage of 5 per cent. of broken grains and 2 per cent. of other impurities is tolerated. Reductions are applied in the case of higher percentages. Similar regulations exist for the other cereals. A premium of at maximum 12 francs per quintal may be granted for brewers'winter- and spring barley having 92 per cent. of germinating power. According to the date of the beginning of harvesting in each department a " prompt delivery premium" is granted on all wheat delivered within three months after that date. The amount of this premium is 25 frs. for the first month, 20 frs. for the second and 10 frs. for the third. A premium of 25 frs. per quintal is granted for *barley* and *rye* delivered before the 16th consecutive day after the beginning of wheat harvesting. Finally, a premium of 5 frs. p. quintal of wheat for early threshing is granted when threshing is done before the 16th consecutive day after the beginning of harvest. A statistical quota of 1 franc per quintal is charged to the producer.

From the establishment of premiums, extra premiums and taxes it results that prices actually paid to farmers for the principal cereals at the beginning of the season, compared with those of the year before, are as follows:

PRODUCTS	August 1942	August 1941
	Francs per quintal	
Wheat, soft, 74 ½ to 75 kg. per hl.	404.50	300.00
Rye, 69 ½ to 70 kg. per hl.	330.40	244.00
Barley, 68 ½ to 69 kg. per hl.	290.30	229.00
Oats, grey or black, 49 ½ to 50 kg. per hl.	268.60	214.00
Oats, white, etc., 46 ½ to 47 kg. per hl.	262.60	209.00

Greece. — The Minister of Finance has fixed as follows the prices to be paid to producers for the quantities of cereals of the new crop which are subject to obligatory sale to the Government:

Wheat	40 drachmas per oka (1.34 liter)
Oats and *barley*	30 » » » » »
Other cereals	33 » » » » »

Producers are allowed to sell on the free market the amounts of cereals left at their disposal.

Hungary. — The President of the Council has promulgated on July 23, 1942, a decree regulating the commerce of cereals during the 1942-43 season which begins on August 1, 1942. Prices to producers are generally the same as last year. The only noticeable changes are those regarding fodder barley and oats, for which this year have been fixed prices holding all over the country, while in 1941-42 a scale of prices (24.00 to 24.50 pengös a quintal for barley and 25.50 to 26.50 pengös a quintal for oats) had been fixed depending upon tho place of delivery. Modifications of little importance have been applied to the scheme of increases and reductions in the case of variation of the basic specific weight.

These prices, f. o. r. in all stations of the country, are as follows:

wheat, merchantable quality, 78 kg. per hl.	30.00	pengös	per	quintal
rye, merchantable quality, 71 kg. per hl.	28.00	»	»	»
fodder barley, 1st quality, 65 kg. per hl.	24.50	»	»	»
unbearded barley	50.00	»	»	»
fodder oats, 41 kg. per hl.	27.00	»	»	»

The prices fixed for *malting barley*, current, « Prima » or « Extra » quality are 29, 30, and 31 pengös per quintal respectively, viz., 1 pengö less than last year.

Italy. — On May, 20, 1942, the Interministerial Committee on Supplies decided that the price of wheat of the new crop be the same as that of last year, i.e., 175 lire for soft and 190 lire for hard wheat. Changes are not allowed in the total prices paid for the delivery to collctive warehouses of the other cereals (rye, barley, oats, maize, raw rice) and beans.

The Fascist Confederations of Agricultural Landowners and Agricultural Labourers, under the control of the Ministry of Agriculture and Forests, must attend to the distribution of premiums to farmers established by the decree of October 10, 1941 which became a law on February 2, 1942.

These premiums are as follows:

(1) 200 lire for each ha. sown to wheat, rye or barley;

(2) 40 lire a quintal for early wheat in southern and insular Italy, and in the provinces of Rome, Littoria and Frosinone; 20 lire a quintal for early cereals produced in northern and central Italy.

The Head of the Government has decreed that these premiums be totally paid to wheat growers who denounced their sowings before April 15, 1942 and to producers who completed the delivery of their wheat to collective warehouses before September 15. By a later decree, this date was extended until September 30. Moreover, a supplementary premium of 20 lire was established for extraordinary expenses in favour of all producers that had delivered their wheat before July 10, 1942.

On the basis of average yields, the premium on sowings may be considered as amountig to 16 lire a quintal for soft or hard wheat harvested in southern and insular Italy and in the provinces of Rome, Frosinone and Littoria (average yield:

12 quintals per ha.) and to 10 lire for wheat harvested in the remainder of the country (average yield: 20 quintals). Average prices paid producers for their wheat may, therefore, be calculated in the following measure:

	For deliveries before July 10 — Lire per quintal	For deliveries before Sept. 30 — Lire per quintal
Southern Italy, etc.:		
soft wheat	251	231
hard wheat	266	246
North and Central Italy	225	205

Minor cereals. — In order to prevent the danger these products be sold at too high a price as compared with the prices of the most important cereals, the Ministry of Agriculture and Forests has fixed also the following sale prices:

Spelt	250 lire a quintal
Buckwheat	180 » »
Millet	180 » »
Sugar sorghum	175 » »

These prices hold for produce sound, merchantable, with at maximum 3 per cent impurities, f. o. r. delivery center.

Norway. — Basic prices to be paid producers for cereals of the 1942 crop are generally higher than last year. An entirely different system of supplementary payments has also been applied: for deliveries between December 1, 1942 and April 30, 1943 a storage premium of 1 öre per quintal and per day has been fixed, so that monthly average prices are as follows:

Period	Wheat	Rye	Barley	Oats and meslin
	Crowns per quintal			
1941 crops (basic price)	35.00	35.00	31.00	28.00
1942 crops (basic price)	36.00	35.00	34.00	32.00
December 1942 average	36.16	35.16	34.16	32.16
January 1943 „	36.47	35.47	34.47	32.47
February „ „	36.77	35.77	34.77	32.77
March „ „	37.07	36.07	35.07	33.07
April „ „	37.37	36.37	35.37	33.37

These prices hold for merchandise in bulk, f. o. r. or f. o. b. or free at warehouse of the district nearest to the producer's farm. Producers of holdings situated at a distance of over 10 km. from the place of delivery, will be allowed 3 1/2 öre a quintal for each km. above 10.

Netherlands. — Basic prices of cereals of the 1942 crop fixed in March of the current year, are payable for a product cleaned at the farm and of ordinary quality, delivered between September 1 and 5. Later, a storing compensation was allowed, for which the regulations were published in August. This compensation amounts to 0.025 fl. per quintal and per week, but it will not be calculated after the week of February 21 to 27, 1943. Thus the following prices will be paid:

Period	Wheat	Rye	Winter barley	Spring barley	Oats	Maize
	Florins per quintal					
September 1, 1941 (basic price)	13.25	12.75	11.60	12.00	9.60	13.25
" 1, 1942 (basic price) s	13.25	12.75	12.00	12.00	10.50	13.25
" 1942 average	13.30	12.80	12.05	12.05	10.55	13.30
October " "	13.41	12.91	12.16	12.16	10.66	13.41
November " "	13.51	13.01	12.26	12.26	10.76	13.51
December " "	13.62	13.12	12.37	12.37	10.87	13.62
January 1943 "	13.74	13.24	12.49	12.49	10.99	13.74
February " "	13.84	13.34	12.59	12.59	11.09	13.84
March to August 1943 average	13.87	13.37	12.62	12.62	11.12	13.87

Portugal. — By a decree enacted on August 11 1942, the Ministry of Economy decided that the price of *wheat*, fixed by the law of August 11, 1938, on the new regulations for cereals, will remain in force also during the 1942-43 season but will be completed by a production supplement amounting to 3,50 escudos per quintal for wheat of the new crop. This means that the price for wheat will be 1.95 escudos above the year 1941.

The same regulation has been adopted for *rye*. The price of this product will be the same as was fixed by the law of August 8, 1941, but it will be increased by a production supplement amounting to 1,50 escudos per quintal. Some modifications have been introduced also in the system of monthly supplements, so that this year rye will be paid the same price in the months of August and September (in 1941 the price remained unchanged from July to September). After then its price will be raised 1 escudo each month (1.30 escudos in 1941), until June 1943 included: the price for the month of July will be the same as that of June. Both wheat and rye producers are obliged to declare the amount of their crops within 10 days after threshing and not later than October 15, 1942. Moreover, by a decree-law dated August 26, 1942, the Minister of Economy ruled also that *maize* growers must declare their production within 10 days after threshing and not later than October 31. The price of white or yellow maize of the new crop was fixed at 125 escudos per quintal up to December 31. After that date until the end of the season and the price will be raised 5 escudos.

The following table shows the prices of the cereals mentioned above, compared with those of the preceding year:

PERIOD	Wheat 77 kg. per hl., 3 ½ imp.		Rye 72 kg. per hl., 3 % imp.		Maize yellow or white, sound, fair, naturally dry	
	1942-43	1941-42	1942-43	1941-42	1942-43	1941-42
	Escudos per quintal					
August	165.10	163.15	114.60	113.10	—	—
September	165.10	163.15	114.60	113.10	125.00	115.00
October	166.40	164.45	115.60	114.40	125.00	115.00
November	167.70	165.75	116.60	115.70	125.00	115 00
December	169.00	167.05	117,60	117.00	125.00	115.00
January	170.30	168.35	118.60	118·30	130.00	120.00
February	171.60	169.65	119.60	119.60	130.00	120.00
March	172.90	170.95	120.60	120.90	130.00	120.00
April	174.20	172.25	121.60	122.20	130.00	120.00
May	175.50	173.55	122.60	123.50	130.00	120.00
June	176.80	174.85	123.60	124.80	130.00	120.00
July	176.80	174.85	123.60	124.80	130.00	120.00

Romania. — The basic prices of the chief cereals of the new crop fixed by a decree of July 16, 1942, are much higher than last year, as it is shown in the following table:

PRODUCTS	1942 crop	1941 crop
	Lei per quintal	
Wheat, 75 kg. per hl., 3 per cent impurities	2,200	1,100
Rye, 68 kg. per hl., 3 per cent impurities	1,600	900
Fodder barley, 60 kg. per hl., 4 per cent impurities	1,400	750
Oats, 42 kg. per hl., 4 per cent impurities	1,500	770
Millet, 70 kg. per hl., 3 per cent impurities	1,800	...

These prices are payable to producers, f. o. r. or f. o. b. station or port of shipping. Increases or reductions depending on specific weight or percentage of impurities are the same as during preceding years. To these prices is added a supplement for cost of transfert to the station or authorised warehouse. This supplement is proportioned as follows: for distances to 5 km, 40 lei a quintal; for distances from 5 to 10 km, from 10 to 15 km., from 15 to 20 km., from 20 to 30 km., and over: 60, 80, 100, 120 and 140 lei respectively.

The price for ***malting barley*** having a specific weight of 63 kg. and 3 per cent impurities, has been fixed, beginning August 29, at 1,750 lei per quintal. Increases and reductions are the same as those calculated for the other cereals.

The decree of June 26 established prompt delivery premiums for ***maize*** above the basic price that was in force during the last season (900 lei per quintal). These premiums amounted to 150, 100 and 50 lei per quintal for deliveries between June 16 and July 15, July 16 and August 15, August 16 and September 15,

respectively. After this last date, the amounts of maize which should have, but were not delivered spontaneously, will be requisitioned and paid a price of 900 lei. Several prefects however, in their provinces, have forbidden all free commerce and have fixed a new maximum price of 1,800 lei per quintal.

Serbia. — The Central Bureau of Cereals has fixed the prices to be paid producers for cereals of the new crop. The price of *wheat* has been fixed at 400 dinars per quintal (against 350 dinars last year) for wheat weighing 78 kg. per hl., delivered free at the warehouse, or f. o. r. or f. o. b. station or shipping port nearest to the buyer 's residence. A prompt delivery premium is granted for wheat delivered within a period of five months; the amount of this premium is 100 dinars for the months of July, August and September, 50 dinars for the months of October and November.

Prices fixed for *rye* and *barley* are the same as those of wheat, while *malting barley* will be paid 500 dinars a quintal.

Slovakia. — Basic prices of cereals of the next crop have not been changed, but farmers will receive from public funds production supplements varying from 34 to 50 per cent. of the prices that had been paid them last year. These premiums amount to 65, 55, 64, 50 and 75 crowns per quintal for wheat, rye, barley, oats and maize respectively. Thus the prices that will actually be paid to farmers are as follows:

Products	1942-43	1941-42
	Crowns per quintal	
Wheat, 79 kg. per hl.	250	185
Rye, 70 kg. per hl.	213	158
Fodder barley	190	126
Oats, 44 kg. per hl.	196	146
Maize	230	155

Sweden. — The basic prices to be paid farmers for cereals of normal quality, delivered at the buyer's warehouse, are the same as last year, but are benefited by a sowing premium. This premium, calculated par ha., amounts to 60 crowns for winter wheat, to 40 crowns for spring wheat, to 45 crowns for rye, and to 50 crowns for barley grown in certain districts of Götaland and Svealand. The total sum of the premium that is to be paid each holding for sowings of winter wheat and rye must not be above 800 crowns. Basic prices are as follows:

winter wheat	27.00	crowns	per	quintal
spring wheat	29.00	»	»	»
rye	27.00	»	»	»
barley	26.00	»	»	»
meslin	24.00	»	»	»
white oats	22.00	»	»	»
black oats	21.50	»	»	»

Switzerland. — Cereal prices are considerably higher than last year, as is shown in the following table:

Products	1942 crop	1941 crop
	Francs per quintal	
Wheat, 77-78 kg. per hl.:		
Standard I (Montcalme)	50,00	45,50
„ II (Plantahof)	51,50	47,00
„ III (Huron)	52,50	48,00
Rye, 71-72 kg. per hl.	48,00	43,50
Fodder barley, 61-65 kg. per hl.	43,00	40,50
Fodder oats, 46-47 kg. per hl.	42,00	40,00
Maize	45,50	43,00

A premium is granted for the culture of wheat and rye at high altitudes. The amount of this premium is 1 or 2 frs. a quintal, according to whether the farm is situated at an altitude of between 800 and 900 m. above sea level or higher.

Turkey. — The prices that the Government will pay for cereals of the 1942 crop which will be delivered at the Government's warehouses, have been raised about 50 per cent. as compared with those that were in force sinee December 10, 1941. These prices are as follows:

Products	1942-43	1941-42 (1)
	Turkish pounds per quintal	
Wheat	26,00	13,50
Rye, barley and white millet	21,00	11,00
Oats, maize and meslin	22,00	11,50

(1) As from December 10, 1941.

Producers are free to sell the quantities which are left in their hands after the obligations delivery of a part of their products. Obligatory deliveries are established in the following measure:

small holdings with a production up to 50 tons: 25 per cent. of the new crop;

medium holdings with a production up to 100 tons: 25 per cent. of the first 50 tons, 35 per cent. of the remainder;

large holdings with a production above 100 tons: 25 per cent. up to 50 tons, 35 per cent. between 50 and 100 tons and 50 per cent. of the remainder.

A prompt delivery premium of 2 Turkish pounds per quintal is granted on wheat and a premium of 1.50 Turkish pounds is granted on rye, barley and millet.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	Sept. 11, 1942	Sept. 4, 1942	August 28, 1942	August 21, 1942	Monthly averages: August 1942	Sept. 1941	Sept. 1940	Sept. 1939	Sept. 1938
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery October	90	90	90	90	90	73 1/4	71 7/8	72 3/8	62
„ December	—	—	—	—	—	74 5/8	73 1/4	74 3/8	61 7/8
„ May	—	—	—	—	—	78 7/8	76	78 1/2	62 1/8
Chicago (cents. p. 60 lb):									
delivery September	122 3/4	120 1/4	118 7/8	118 3/4	118 5/8	* 117 3/4	* 75 7/8	* 83 5/8	* 63 1/8
„ December	126 3/8	123 1/8	122 1/2	121 5/8	121 5/8	121 3/8	77 3/8	82 3/4	64 5/8
„ May	129	127	126 3/8	125 1/2	125 3/8	125 7/8	78 1/8	83 5/8	65 5/8
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery October	57 7/8	53 7/8	54	54 3/8	54 3/8	61 7/8	43 3/8	55 3/8	40
„ December	58 7/8	54 3/4	54 5/8	55 1/2	* 55 1/4	61 1/2	44 1/8	54 3/4	40 5/8
„ May	—	—	—	—	—	63 3/8	46 1/8	56 3/4	42 3/4
Chicago (cents p. 56 lb.):									
delivery September	67 3/4	63	62 3/8	62 3/4	63 5/8	* 74 5/8	* 40 5/8	* 50 3/4	* 41 5/8
„ December	71 3/8	67	66 3/4	67	67 7/8	76 5/8	43 3/4	52 3/8	45 1/8
„ May	77	72 7/8	72 1/2	72 3/4	73 1/8	82 1/8	46 7/8	55 1/8	44 3/4
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery October	61 1/4	60 7/8	60 7/8	60 1/4	60 3/4	56 5/8	35 5/8	45 5/8	36
„ December	61	61	60 3/4	60 5/8	60 5/8	56 1/8	35 1/8	44 5/8	35 7/8
„ May	—	—	—	—	—	56	36 1/8	46	37 1/8
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery October	47 3/8	48 3/8	47 1/4	46 5/8	46 5/8	48 3/8	30	35 7/8	29 5/8
„ December	46	46 1/8	47 5/8	45 1/2	46 1/8	46 1/8	28 1/2	34 3/4	28 1/8
„ May	—	—	—	—	—	45 5/8	28 7/8	35 3/8	29 3/4
Chicago (cents p. 32 lb.):									
delivery September	50 1/8	50 1/4	49 7/8	49 7/8	49 3/4	* 50 5/8	* 29 7/8	* 35 1/8	* 24 5/8
„ December	51 1/2	51 5/8	51 5/8	51 1/4	51 5/8	52 1/8	30 1/8	34	25 1/4
„ May	53 1/4	53 5/8	53 3/4	53 5/8	53 1/2	54 1/4	30 7/8	34 1/4	26 1/8
Maize.									
Chicago (cents p. 56 lb.):									
delivery September	83 5/8	83 1/8	83 1/8	84 7/8	85 5/8	* 78	* 62 3/4	* 55 3/4	51 7/8
„ December	85 3/4	86 1/8	86 3/8	87 3/8	87 7/8	82 3/4	56 7/8	53 7/8	49 3/4
„ May	89 7/8	90 3/8	90 1/8	91 1/2	92	87 7/8	57 7/8	56 5/8	51 7/8
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery October	164	164	164	164	164	155 1/4	118 1/8	165	136 1/8

* Indicates that the product was not quoted during part of the period under review.

INDEX-NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS AND OF COMMODITIES BOUGHT BY THE FARMER

Description	June 1942	May 1942	April 1942	March 1942	Feb. 1942	Jan. 1942	June 1941	June 1940	Year 1941-42 (3)	Year 1940-41 (3)
Germany										
(Statistisches Reichsamt; products sold by farmers) Average for corresponding months 1909-10/1913-14 = 100.										
Cereals	108	108	112	114	114	113	111	110	112	111
Edible potatoes	115	120	117	115	116	121	115	115	126	118
Plant products	109	112	113	114	114	114	112	111	115	113
Meat animals	113	113	108	108	107	106	107	102	105	99
Livestock products (butter and eggs)	143	138	131	121	120	123	142	142	127	127
Livestock and livestock products	123	121	115	112	111	111	119	115	112	107
Total agricultural products	121	119	115	112	112	112	118	115	113	109
Germany									1941	1940
(Statistisches Reichsamt; wholesale products) 1913 = 100.										
Agricultural products	(4) 115.2	114.7	113.3	112.7	112.6	113.7	114.0	112.3	112.4	110.7
Fertilizers	50.0	53.8	55.7	55.7	55.7	55.2	49.0	49.6	53.9	53.1
Consumption goods (1)	148.8	148.5	148.0	148.1	146.9	147.0	146.6	141.8	146.9	141.6
Wholesale products in general	(5) 114.3	114.3	113.8	113.6	113.4	113.7	112.4	110.4	112.2	110.0
Argentina										
(Banco Central de la República Argentina) 1926 = 100.										
Cereals and linseed	60.0	61.0	60.7	60.5	...	...	59.9	69.9	60.3	68.8
Meat	130.7	134.5	131.4	121.5	...	...	102.4	105.7	102.4	102.9
Hides and skins	116.9	118.1	119.0	119.5	...	...	100.8	77.3	103.4	92.1
Wool	104.5	112.9	115.8	121.7	...	...	117.6	108.7	110.5	116.6
Dairy products	100.3	93.3	78.2	71.0	...	...	102.5	88.3	98.4	82.0
Forest products	(6) 121.5	121.5	121.5	121.5	...	...	121.5	111.2	120.2	112.8
Total agricultural products	80.9	82.5	81.7	80.1	...	...	76.2	79.9	75.9	80.4
Non-agricultural commodities	218.0	215.6	210.9	206.1	...	...	155.8	135.9	163.4	135.4
Wholesale products in general	(7) 188.5	187.0	183.1	179.0	...	...	138.7	123.9	144.7	123.4
Denmark										
(Det landökonomiske Driftsbureau) Average 1909 to 1914 = 100										
Cereals	216	216	216	216	216	216	207	162	210	179
Total plant products (2)	287	290	278	268	261	262	246	203	248	210
Dairy products	221	221	221	221	221	221	221	134	216	156
Total animal products (2)	230	226	226	227	225	226	221	142	219	161
Total agricultural products	234	230	230	230	228	228	222	146	221	165
Fertilizers	167	168	173	168	165	167	169	124	170	134
Concentrated feedingstuffs	—	—	—	—	—	—	—	179	—	187
Seeds	366	366	366	366	366	366	238	141	235	141
Total products purchased	—	—	—	—	—	—	—	164	—	171

(1) Household goods of all kinds, and clothing. (2) — Including non-specified products. — (3) Agricultural year: July 1-June 30. — (4) July: 116.1; August: 116.7. — (5) July: 114.7; August: 115.0. — (6) July 121.5. — (7) July: 191.1.

Description	June 1942	May 1942	April 1942	March 1942	Feb. 1942	Jan. 1942	June 1941	June 1940	Year 1941	Year 1940
Hungary										
(Central Royal Bureau of Statistics) 1929 = 100.										
Cereals	...	132.1	132.1	132.1	132.1	132.1	105.6	91.7	118.5	96.2
Total raw plant products (¹)	...	146.1	145.1	140.0	135.0	134.5	113.6	96.4	122.7	101.9
Meat animals, meat and lard	...	136.5	134.6	133.4	134.0	133.0	126.4	86.2	122.9	87.1
Total livestock products (¹)	...	127.6	126.7	126.4	126.8	124.5	112.9	83.1	114.2	85.1
Total agricultural products	...	140.3	139.3	135.7	132.4	131.4	113.4	92.2	120.0	96.7
Products of agricultural industries	...	150.4	150.4	150.8	150.8	150.8	108.5	99.0	125.0	101.0
Industrial raw materials and products.	...	152.3	150.0	148.7	146.9	143.9	118.6	103.1	123.3	102.3
Wholesale products in general.	...	147.9	146.4	144.4	142.2	140.3	115.9	98.7	122.7	100.3
Norway									1941-42 (²)	1940-41 (²)
(Kgl. Selskap for Norges Vel) Average 1909-1914 = 100.										
Cereals	257	257	257	257	257	257	213	175	239	195
Potatoes	319	299	289	279	279	259	250	369	268	282
Pork	248	248	248	248	248	248	247	163	244	177
Other meat	285	265	265	265	265	265	265	196	265	217
Dairy products	221	221	221	219	219	219	219	198	219	208
Eggs	233	233	233	233	233	233	217	147	224	169
Concentrated feedingstuffs	201	201	201	201	201	201	214	199	209	285
Maize	—	—	—	—	—	—	—	188	—	194
Fertilizers	106	106	106	106	106	106	123	124	118	127
Netherlands										
(Bureau of Agriculture) Average 1924-25 to 1928-29 = 100.										
Plant products	95	94	92	91	89	78	86	73	90	79
Livestock products	113	117	119	112	101	97	102	77	104	89
Total agricultural products	(⁴) 109	112	113	107	98	95	98	76	101	87
Agricultural wages	...	...	...	...	...	...	86	86	...	86
Switzerland									1941	1940
(Schweizerischer Bauernverband) 1914 = 100.										
Slaughter cattle	208	203	200	189	187	184	161	128	159	128
Slaughter pigs	242	241	240	240	239	226	222	141	212	154
Milk (base price)	159	159	159	159	159	159	147	135	149	135
Total agricultural products	(⁵) 194	193	191	188	187	184	170	138	176	144
Feedingstuffs (³)	203	203	203	202	202	201	202	137	194	146
Fertilizers (³)	145	145	145	145	145	145	126	112	127	113
Wholesale products in general (⁶)	209.5	209.2	207.8	202.6	204.8	201.8	184.4	138.7	183.5	143.0

(¹) Including unspecified products. — (²) Agricultural year: Norway: April 1 to March 31; Netherlands: July 1 to June 30. — (³) Index numbers calculated by the Bundesamt für Industrie, Gewerbe und Arbeit; base July 1914. — (⁴) July: 104. — (⁵) July: 197. (⁶) July: 212.2.

APPENDIX

DISTRIBUTION OF SHEEP ACCORDING TO AGE SEX AND DESTINATION

by Valentino DORE.

This article deals with the classification of sheep in livestock statistics. It follows the articles on the classifications of cattle and pigs which appeared in the June and July-August issues of this Bulletin, and belongs to the series of studies dealing with some particular aspects of the improvement and unification of agricultural statistics which official statisticians may be called to examine, as soon as circumstances will allow, in order to give them an international solution.

1. — The standard form contained in the agenda of the 1940 World Agricultural Census prepared by the two Conferences of Agricultural Statisticians which took place at Rome on the initiative of the International Institute of Agriculture in October 1936 and December 1937, recommended the adoption of the following categories for the animals of the sheep species:

Lambs under one year old:
Rams one year of age and over;
Ewes one year of age and over;
All other sheep one year of age and over.

We are now going to see how far the details furnished by the statistics of a number of countries correspond to this minimum classification suggested by the Institute.

2. — It may be remarked that a rather large number of countries, in their statistics on the number of livestock, do not furnish any information on the distribution of sheep according to age, but limit themselves to give only one figure indicating the total number of heads for the whole species. Owing to the fact that the returns are not gathered at the same period of the year in the different countries, and especially that according to the season, the number of young animals shows very considerable variations which are likely to strongly modify, from one period to the other, the total number of heads, international comparisons based exclusively on total figures may be misleading.

Available data for a limited number of countries which take two statistical surveys of their livestock, one in winter and the other in summer, make it possible to establish in what measure season variations may influence results.

As an average, in the years surveyed, livestock heads in summer were higher than those registered in winter, by 15.8 per cent. in Germany, 28.2 per cent. in England and Wales, 32.0 per cent. in Scotland, 58.8 per cent. in Northern Ireland, 38.9 per cent. in Ireland, 50.7 per cent. in the U. S. S. R., 27.1 per cent. in Canada.

I. — *Results of Sheep enumerations in Winter and in Summer.*

COUNTRY	Date	Sheep under 1 Year old		Sheep 1 Year old and over		Total sheep	
		Winter (1)	Summer (2)	Winter (1)	Summer (2)	Winter (1)	Summer (2)
Germany	1935	1,298,822	1,786,875	2,628,857	2,752,891	3,927,679	4,539,766
	1936	1,444,184	2,015,360	2,896,606	2,891,161	4,340,790	4,996,521
	1937	1,539,596	2,115,366	3,152,679	3,248,403	4,692,275	5,363,769
	1938	1,572,400	2,220,620	3,236,600	3,458,505	4,809,000	5,679,125
England and Wales	1935	4,154,000	7,595,438	8,508,000	8,881,562	12,662,000	16,477,000
	1936	4,375,000	7,741,551	8,537,000	8,906,475	12,912,000	16,648,026
	1937	4,973,000	8,386,910	8,767,000	8,807,273	13,740,000	17,194,183
	1938	4,318,000	7,687,508	9,581,000	10,225,000	13,899,000	17,912,508
Scotland	1935	1,757,000	3,380,090	3,966,000	4,386,325	5,723,000	7,766,415
	1936	1,766,400	2,373,090	3,834,400	4,284,307	5,600,800	7,557,397
	1937	1,963,400	3,261,865	3,880,100	4,256,006	5,843,500	7,517,871
	1938	2,105,300	3,504,313	4,249,300	4,465,169	6,354,600	7,969,482
	1939	—	3,541,764	—	4,465,370	—	8,007,134
Northern Ireland	1935	—	398,452	—	419,852	—	818,304
	1936	63,805	403,298	457,914	431,456	521,719	834,754
	1937	70,418	405,954	459,899	422,897	530,317	828,851
	1938	90,984	432,808	469,908	460,623	560,892	893,431
	1939	71,275	437,105	479,987	457,507	551,262	894,612
Ireland	1938	—	1,337,800	—	1,858,800	—	3,196,600
	1939	410,400	1,271,700	1,883,300	1,776,100	2,293,700	3,047,800
	1940	383,700	1,288,900	1,871,900	1,781,700	1,255,600	3,070,600
	1941	396,500	1,171,100	1,798,700	1,738,300	2,195,200	2,909,400
	1942	384,300	—	1,673,000	—	2,057,300	—
U. S. S. R. (3)	1935	15,054,300	27,105,900	25,724,600	33,945,400	40,778,900	61,051,300
	1936	18,959,600	—	30,940,400	—	49,900,000	73,300,000
	1937	—	—	—	—	53,800,000	81,300,000
	1938	—	—	—	—	66,600,000	102,500,000
Canada	1935	—	1,529,110	—	1,869,990	2,628,700	3,399,100
	1936	—	1,506,300	—	1,820,800	2,625,500	3,327,100
	1937	—	1,504,900	—	1,835,000	2,673,800	3,339,900
	1938	—	1,577,100	—	1,837,900	2,671,000	3,415,000
	1939	—	1,560,700	—	1,805,100	2,653,000	3,365,800

(1) Germany, England and Wales, Scotland and Canada: December; Northern Ireland, Ireland and U.R.S.S.: January. — (2) June (U. S. S. R.: July). — (3) Including goats.

The details contained in Table I show very clearly that the differences between the results registered in winter and in summer depend almost exclusively on the existence of a far larger number of young animals in summer than in winter. Generally speaking, the figures relative to adult animals do not show important variations according to the season.

This ascertainment emphasizes the great importance of the recommendation made by the International Institute of Agriculture that, from the point of view of international comparisons, all countries adopt the distinction between young animals (under one year old) and adult ones (one year old and over).

3. — Table II shows the available details regarding the countries where statistics indicate the distribution of the total number of sheep according to age.

The one year limit suggested in the standard form as a basis for the distinction between lambs and adult animals, is adopted by nearly all the countries surveyed. The only exceptions are Portugal, Switzerland and Czechoslovakia that count, on one side the animals under six months, and on the other side

those of six months and over. Another exception is represented by Bulgaria, where the limit has been raised to one year and a half.

In Table II, side by side of the figures indicating the number of young and adult animals, has been indicated the proportion of the heads included in each of the two categories as compared with the total number of sheep.

In the study of these proportional figures, and in order to correctly interpret their significance, one must take into account the time at which the surveys were made in each country, owing to the fact that (as has been said before) the season factor has a heavy influence over the relative importance of young animals. During recent years, the proportion of young animals, as compared with the total number of sheep, has varied, on an average, from 32.9 per cent. in winter to 39.5 per cent in summer in Germany, from 33.5 per cent. to 46.0 per cent. in England and Wales, from 32.3 to 41.4 per cent. in Scotland, from 13.7 per cent. to 48.7 per cent. in Northern Ireland and from 17.9 per cent. to 41.5 per cent. in Ireland.

II. — *Distribution of sheep according to age.*

Country	Date		Sheep under 1 year old	Sheep 1 year old and over	Total sheep	% to total number of sheep: under 1 year old	% to total number of sheep: 1 year old and over
Albania	1938		289,931	1,283,926	1,573,857	18.4	81.6
Germany	Dec.	1937	1,539,596	3,152,679	4,692,275	32.8	67.2
Austria	June	1930	61,803	190,425	272,228	30.0	70.0
Bulgaria	Dec.	1934	(1) 2,098,536	(2) 6,740,956	8,839,492	(1) 23.7	(2) 76.3
Denmark	July	1937	77,940	109,100	187,040	41.7	58.3
Spain	July	1939	7,734,034	14,044,848	21,778,882	35.5	64.5
Estonia	June	1929	216,950	258,955	475,935	45.6	54.4
Finland	Sept.	1938	467,365	605,593	14,072,958	43.6	56.4
France	Nov.	1938	2,505,020	7,367,340	9,872,360	25.4	74.6
Greece	Nov.	1938	5,490,731	2,648,041	8,138,772	67.5	32.5
Hungary	Feb.-March	1939	495,962	1,372,160	1,868,122	26.5	73.5
Ireland	June	1939	1,271,707	1,776,106	3,047,813	41.7	58.3
Italy	March	1930	2,263,572	8,004,547	10,268,119	22.0	78.0
Latvia	June	1939	823,700	645,000	1,468,700	56.1	43.9
Lithuania	Dec.	1939	72,370	509,770	582,140	12.4	87.6
Netherlands	May	1939	351,286	338,215	689,501	50.9	49.1
Poland	Nov.	1927	314,182	1,603,655	1,917,837	16.4	83.6
Portugal	Dec.	1934	(3) 831,113	(4) 2,442,839	3,273,952	(3) 25.4	(4) 74.6
Romania	1938		1,650,161	11,117,349	12,767,510	12.9	87.1
United Kingdom:							
England and Wales	June	1938	7,850,817	10,061,961	17,912,508	43.8	56.2
Scotland	Dec.	1938	2,105,300	4,249,300	6,354,600	33.1	66.9
Northern Ireland	June	1938	432,808	460,623	893,431	48.4	51.6
Sweden	Sept.	1932	166,831	301,417	468,248	35.6	64.4
Switzerland	April	1936	(3) 49,910	(4) 126,166	176,076	(3) 28.3	(4) 71.7
Czechoslovakia	Jan.	1938	(3) 39,082	(4) 604,448	643,530	(3) 6.1	(4) 93.9
Yugoslavia	Dec.	1939	1,861,379	8,292,452	10,153,831	18.3	81.7
U. S. S. R.	Jan.	1935	13,492,000	22,871,200	(5) 36,363,200	37.1	62.9
Canada	June	1939	1,560,700	1,805,100	3,365,800	46.4	53.6
United States	Jan.	1940	8,671,000	45,802,000	54,473,000	15.9	84.1
Argentina	June	1937	10,882,971	32,815,692	(6) 43,698,663	24.9	75.1
Chile	April	1936	1,438,242	4,310,827	5,749,069	25.0	75.0
Uruguay	May	1937	4,152,997	13,778,330	17,931,327	23.2	76.8
Japan	Dec.	1938	19,441	94,559	114,000	17.1	82.9
Union of South Africa (7)	August	1937	6,929,958	30,134,990	37,064,948	18.7	81.3
Australia	March	1938	23,031,555	90,340,963	113,372,518	20.3	79.7
New-Zealand	April	1939	7,702,923	24,194,168	31,897,091	24.1	75.9

(1) Sheep under 1 ½ year. — (2) Sheep 1 ½ year old and over. — (3) Sheep under 6 months. — (4) Sheep 6 months old and over. — (5) Not including 7,900 not specified heads. — (6) Not including 184,065 not specified heads. — (7) Only sheep owned by Europeans.

4. — Owing to the different time at which the statistical surveys are taken, neither the number of lambs nor the total number of sheep can furnish a satisfactory indication on the relative importance of sheep raising in the different countries. More satisfactory international comparisons, on the contrary, may be made on the basis of the number of adult animals which are stable enough during the whole year.

As regards this category (animals one year old and over) the standard classification recommended by the Institute suggests a further subdivision in to three groups: rams, ewes, other sheep.

In Table III have been gathered all the details furnished by several countries, grouping them, as much as possible, according to the subdivision indicated above.

In all the countries under survey, ewes represent the most important part of adult animals: their proportion varies between 70 and 95 per cent. of the total.

The proportion of rams, on the contrary, is generally very low and, except for some exception, varies between 2 and 4 per cent. of the total.

The highest differences are registered in the group of other sheep one year old and over for which the proportion vary from a minimum of 0.5 per cent. in Italy to a maximum of 28.2 per cent. in England and Wales.

III. — *Distribution of sheep 1 year old and over.*

Country	Date	Rams	Ewes	Other sheep	% of total number of sheep 1 year old and over: Rams	Ewes	Other sheep
Germany	Dec. 1937	61,135	2,723,307	368,237	1.9	86.4	11.7
Austria	June 1930	16,255	156,767	17,408	8.6	82.3	9.1
Bulgaria (1)	Dec. 1934	270,598	6,425,491	44,867	4.0	95.3	0.7
Denmark	July 1937	7,885	← 101,215	→	7.2	← 92.8	→
Spain	July 1939 (8)	517,958	12,137,269 (6)	1,389,621 (4)	3.7	86.4 (6)	9.9
Estonia	June 1929	9,977 (4)	249,008	...	3.9 (4)	96.1	...
France	Nov. 1938	200,080	6,156,660	1,010,600	2.7	83.6	13.7
Hungary	Feb.-March 1939	48,323	1,102,293	221,544	3.5	80.3	16.2
Ireland	June 1939	50,124 (3)	1,298,260 (7)	427,722	2.8 (3)	73.1 (7)	24.1
Italy	March 1930	340,443	7,622,648	41,456	4.3	95.2	0.5
Netherlands	May 1939 (8)	6,008 (5)	248,589 (7)	83,618 (4)	1.8 (4)	73.5 (8)	24.7
Poland	Nov. 1927	33.821	1,491,557	78,277	2.1	93.0	4.9
Portugal (9)	Dec. 1934	...	2,084,693 (9)	358,146	...	85.3	14.7
Roumania	1938	440,465	10,597,527	79,357	4.0	95.3	0.7
United Kingdom:							
England and Wales	June 1938 (4)	196,684 (5)	7,021,850 (7)	2,843,157 (4)	2.0 (5)	69.8 (7)	28.2
Scotland	Dec. 1938 (5)	132,300 (5)	3,812,100 (7)	304,900 (4)	3.1 (5)	89.7 (7)	7.2
Northern Ireland	June 1938 (8)	12,772 (4)	401,850 (7)	46,001 (5)	2.8 (4)	87.2 (7)	10.0
Czechoslovakia (8)	Jan. 1938	30,858	531,895	51,695	3.5	88.0	8.5
Yugoslavia	Dec. 1939 (4)	414,233 (5)	6,975,163 (7)	903,056 (4)	5.0 (5)	84.1 (7)	10.9
U. S. S. R.	Jan. 1935	866,800	21,576,000	428,400	3.8	94.3	9.1
United States	Jan. 1940	... (4)	37,395,000 (10)	8,407,000	... (4)	81.6 (10)	18.4
Argentina	June 1937	1,110,274	27,541,683	4,163,735	3.3	83.9	12.7
Chile	April 1936	167,366	3,633,853	509,608	3.9	84.3	11.8
Uruguay	May 1937	284,721	9,829,638	3,663,971	2.1	71.3	26.6
New-Zealand	April 1939	543,626	20,835,484	2,815,058	2.2	86.1	11.7

(1) Sheep 1 ½ year old and over. — (2) Rams 2 years old and over. — (3) Including rams under 2 years. — (4) Including wethers. — (5) For breeding. — (6) Including ewes other than for breeding. — (7) Including rams and ewes other than for breeding. — (8) Sheep 6 months old and over. — (9) Including rams. — (10) Including rams and also ewes other than for breeding.

The differences in the proportion of the different groups of sheep one year old and over, are undoubtedly the consequence, first of all, of the orientation of raisings, viz., of the more or less large measure in which sheep is raised for the production of lamb meat and milk or the production of mutton meat.

It cannot be excluded, however, that in some cases the differences may be accentuated by the fact that some countries register among " rams " and " ewes " only such animals as are destined to breeding [1], while others include respectively all non-castrated animals and all ewes. These different intrepretations of the words " rams " and " ewes " carry with them the consequence that the third group, including " all other sheep one year old and over ", is more or less comprehensive. It may be limited to muttons only, or else include also rams and especially ewes for fattening.

It is desirable that this point be cleared and that a uniform solution be adopted by all countries.

5. — The same reservations regarding the possibility that the terms " rams " and " ewes " be not uniformly applied in all countries, must not be overlooked in the case of the figures of Table IV, in which the average number of rams for every 100 ewes has been calculated.

IV. — *Number of rams for 100 ewes.*

Country	Number of rams	Country	Number of rams
Austria	10.4	Ireland [1]	3.9
Yugoslavia [1]	5.9	Czechoslovakia [2]	3.9
Chile	4.6	Scotland [1]	3.5
Italy	4.5	France	3.2
Hungary	4.4	North Ireland [1]	3.2
Spain [3]	4.3	Uruguay	2.9
Bulgaria [4]	4.2	England and Wales [1]	2.8
Romania	4.2	New Zealand	2.6
Estonia	4.0	Netherlands [1]	2.4
U. S. S. R.	4.0	Poland	2.3
Argentina	4.0	Germany	2.2

[1] Animals for breeding. — [2] Rams 2 years old and over. — [3] Animals 6 months old and over. — [4] Animals one and a half year old and over.

The comparatively high proportion of rams as compared with ewes in Austria cannot be easily explained

In all the other countries, the proportion between rams and ewes appears to be rather regular, as it varies from a minimum of 2.2 rams for every 100 ewes in Germany to a maximum of 5.9 rams for every 100 ewes in Yugoslavia.

[1] In the notes to Table III have been indicated as having adopted this solution, only a limited number of countries whose statistics state precisely that it is the question of " rams for breeding " and " ewes for breeding ". But it is possible that a limited interpretation in the same sense may have been adopted by other countries without it being explicitly declared.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT
AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country : Germany, Bohemia and Moravia (Protectorate); Hungary : 1 = *excellent,* 2 = *good,* 3 = *average,* 4 = *poor,* 5 = *very poor; Finland :* 8 = *very good,* 6 = *above the average,* 5 = *average; France :* 100 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *average,* 30 = *poor; Romania and Sweden :* 5 = *excellent,* 4 = *good,* 3 = *average,* 2 = *poor,* 1 = *very poor; Netherlands :* 90 = *excellent,* 70 = *good,* 60 = *fairly good,* 50 = *below awerage; Portugal :* 100 = *excellent,* 80 = *good,* 60 = *average,* 40 = *poor,* 20 = *very poor; Switzerland :* 100 = *excellent,* 90 = *very good,* 75 = *good,* 60 = *fairly good,* 50 = *average,* 40 = *rather poor,* 30 = *poor,* 10 = *very poor; U. S. S. R. :* 5 = *good,* 4 = *above the average,* 3 = *average,* 2 = *below average,* 1 = *poor; Canada :* 100 = *crop condition promising a yield equivalent to the average yield of a long series of years; United States :* 100 = *crop condition which promises a normal yield; Egypt :* 100 = *crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed :* 100 = *crop condition which promises a yield equal to the average of the last ten years.*

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

See latest information at page 370

1942 **No. 10**

VEGETAL PRODUCTION

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE, BARLEY AND OATS.

Bulgaria: In compliance with article 22 of the law on civil mobilisation, the Council of Ministers has authorised the Minister of Agriculture to organise Autumn sowings and to improve all the arable land that may have been left uncultivated heretofore. A special plan of Autumn sowings has been carefully prepared, which should not leave uncultivated any land at all, even in the regions of Macedonia, Dobruja and along the Aegean sea. All State and communal agricultural engineers as well as retired agronomists have been mobilised for the execution of this plan. The necessary personnel and equipment have been sent to the regions that needed them.

The area sown to rye, which in the years 1935 to 1942 had varied between 420.000 and 520.000 acres, is going to be much larger in 1943. In fact, according to the plan, it should be increased to 900.000 acres.

Spain: According to the National Review of Agricultural Economics « Ceres » of Valladolid, the production of cereals amounted to the following figures (the figures for the year 1942 are compared with those of 1941):

	1942	1941	1942	1940
	(centals)		(bushels)	
Wheat	65.125.000	64.466.000	108.539.000	107.440.000
Rye	14.477.000	11.115.000	25.852.000	19.848.000
Barley	34.895.000	33.627.000	72.699.000	70.058.000
Oats.	13.276.000	12.284.000	41.487.000	38.386.000

Finland: According to press reports, the cold and wet weather of the last few weeks in the regions where harvest was not yet over, has had some damaging effects. In Eastern Carelia, where a fine crop was expected, the production of cereals is now estimated only average. In the north, center and east of Bothnia, yields are very small as a result of continued bad weather. A State Commission has been charged to establish the size of this deficit and to prepare measures to make its consequences less serious.

Greece: According to unofficial information, wheat production this year was very low. Notwithstanding all the measures that had been taken to insure a satisfactory crop, only 7,700,000 centals or 12,900,000 bushels were obtained this year against 17.600,000 centals or 29,400,000 bushels averaged during the last years before the war.

Hungary: Up to the beginning of October, plowing of heavy soils preparatory to sowings of winter cereals, had been done only in spots where there had been some rain. Sowings of winter cereals, however, had begun in sandy soils.

Romania: Up to October 10 ult., a heavy drought was reported all over Romania. After that date, rather abundant rains fell especially in the western and central parts of the country. Plowing and sowing had been done only in part. Agricultural and administrative authorities are carrying on an extensive propaganda among the farmers in order to intensify the sowing of wheat, rye and winter barley, even on dry soil and also on land that before had been sown to maize. The national agricultural plan foresees a big increase of area to wheat and especially to winter barley. As it was done last year, the Romanian Government has taken this year also all necessary measures for the distribution of seeds of good quality and in sufficient quantity. A credit of 1,5 miliard *lei* has been put at the disposal of the Ministry of Agriculture for the financing of the 1942-43 sowing season.

Argentina: According to the third estimate wired to the Institute by the Argentine Ministry of Agriculture on October 23 ult., the area sown to cereals in 1942-43, compared respectively with the figures of the previous season and the average of the five years ending in 1940/41, was as follows:

Area.

(1,000 acres)

	1942-43	1941-42	Average 1936-37 to 1940-41	% 1942-43: 1941-42 = 100	% 1942-43: Average = 100
Wheat	16,309	18,039	19,336	90.4	84.3
Oats	3,329	3,519	3,757	94.6	88.6
Barley	1,838	1,972	1,943	93.2	94.6
Rye	2,372	2,661	2,711	89.1	87.5

The considerable reduction that may be noticed especially for wheat, was due chiefly to the existence in the country of heavy unsold surplus stocks of the two preceding seasons, of which, owing to the war, only a very small part could be sold.

(Telegram of October 30). The condition of the wheat crop is good.

CURRENT INFORMATION ON MAIZE.

Spain: According to the National Review of Agricultural Economics « Ceres » of Valladolid, the 1942 production of maize is estimated at 10,426,000 centals, against 13,970,000 centals in 1941 (18,619,000 and 24,947,000 bushels respectively).

Hungary: At the beginning of October maize harvesting was in full swing. Dry, warm weather has been favourable to the harvesting of early varieties and to the ripening of late ones. Competent authorities are carrying on an intense propaganda among farmers to encourage them to cut maize stalks within the month of October and thus obtain a good feed for livestock. Maize stalks left standing in the fields after harvesting, lose rapidly their nutritive value. Delays in cutting and storing of maize stalks represent a loss both for the farmers and national economy.

Romania: At October 4, the harvest of maize was still on. Many maize fields have been hit by the drought and yields are very low.

Argentina: According to the third official estimate, the production of maize in 1941-42 amounted to 199,166,000 centals (355,655,000 bushels) against 225,710,000 centals (403,054,000 bushels) in 1940-41 and an average of 169,115,000 centals (301,991,000 bushels) in the five years 1935-36 to 1939-40. While the production of the present season was 11,8 per cent. below the very big one of the year 1940-41, it was very good nevertheless, especially if the fact is taken into account that the area sown to maize was 18.0 per cent. less than in 1940-41, and 22.6 per cent. less than the average for the five preceding years The excellent result of the present season must be attributed to very favourable weather conditions during the vegetative period of the crop.

CURRENT INFORMATION ON RICE.

Argentina: According to the third official estimate, the production of rice in 1941-42 amounted to 2,381,000 centals (5,291,000 bushels). This estimate is slightly below the preceding one. In 1940-41, rice production amounted to 1,235,000 centals (2,743,600 bushels): the average was 1,412,000 centals (3,137,000 bushels). Percentages: 192.9 and 168.9. The big crop of the present season is partly due to the increase of acreage, but chiefly to the very favourable weather conditions that prevailed during the period of development of rice.

Chosen: The production of raw rice in 1942-43 is estimated at 63,176,000 centals (140,388,000 bushels against 101,883,000 (226,403,000) in 1941-42 and an average of 87,209,000 (193,794,000) in 1936-37 to 1940-41; percentages, 62.0 and 72.4.

Japan: Notwithstanding typhoons that raged in the first days of September the production of raw rice is estimated at 275,372,000 centals or 611,925,000 bushels.

This production is 22 per cent. bigger than that of the season 1941-42 which had amounted to 225,453,000 centals or 500,997,000 bushels, and 2 per cent. above the average production of the preceding five years, which had amounted to 269,583,000 centals or 599,062,000 bushels.

CURRENT INFORMATION ON POTATOES.

Bulgaria: Beginning with the month of September, the use of potatoes for industrial purposes has been forbidden. All potato stocks stored in factories must be immediately reported to the Food Commissary.

Denmark: At October 1, the condition of the potato crop was quoted 94 against 96 at September 1.

Spain: According to the National Review of Agricultural Economics « Ceres » of Valladolid, the 1942 potato crop is estimated at about 136,687,000 centals (227,807,000 bushels) against 143,301,000 centals (238,830,000 bushels) in 1941.

Finland: Press reports indicate that the potato crop will be above average.

Hungary: At the beginning of the month of October, potato gathering had generally ended. Only potatoes cultivated for industrial purposes were still in the fields at that time.

Ireland: According to official estimates, the area cultivated to potatoes in 1942, amounted to 424,300 acres, compared with 428,100 in 1941 and 334,400 on the average of the five years 1936 to 1940; percentages: 99.1 and 126.9

THE SUGAR SEASON

The comparatively cold and rainy weather of the first two weeks in August all over the sugar beet producing countries of northern Europe, retarded the development of the beet roots which showed also some vegetative irregularities. The only advantage that could be gained under these circumstances was that little damage was done by insects. In the countries of central and southern Europe, weather conditions in the same period of time were more favourable to the beet crop, and although somewhat cold in some regions, it was generally drier than in the northern countries.

In the second part of the month, on the contrary, the weather was generally warm and dry all over Europe. Then, in the northernmost countries, the vegetation of sugar beets became better and made good progress, but at the end of August the growth of the plants was still behind, especially in Latvia, Lithuania and Denmark. In Finland and Sweden, on the contrary, progress was quite remarkable.

Southernmost, considerable differences in the condition of the beet crop were noticeable in the Netherlands and Belgium in spite of the fact that these two countries are so near. While in the Netherlands the leaves of the beet plants were luxuriant and had a fresh and healthy appearence, in Belgium on the contrary the crop showed clear signs of having been badly hit by the warm and very dry weather that prevailed in the month of August. The leaves had begun to turn yellow and the roots were small for want of humidity. In France, sugar beets that had been seeded early were in better condition than those seeded later.

In the countries of Southern Europe, the rainfalls of the second part of August helped the revival of the sugar beet crops which had begun to suffer from the effects of the drought. In the Balkan countries, however, the improvement was not very important, on account of the drought that had already lasted several months, without any appreciable interruption. Plowing could not always be completed, and the yellow shade of the leaves showed clearly the effects of the drought. These effects were especially noticeable in Bulgaria, where the

leaves turned yellow very early and the roots were very slow in their development. In Italy, the weather of the month of August had practically no influence on the beet crop, because by that time the pulling out of roots was already almost over.

Damages by insects were confined within normal limits.

1942-1943 season. — Analysis of sugar-beets.

Countries and date of analysis	Average weight of root			Average weight of leaves			Sugar content			Weight of sugar per root		
	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940	1942	1941	1936-1940
	oz.	oz.	oz.	oz.	oz.	oz.	%	%	%	oz.	oz.	oz.
Belgium												
3rd week of August	10.0	13.7	12.7	24.6	25.8	24.4	12.2	12.3	13.1	1.2	1.7	1.7
4th week of Sept.	21.0	25.7	[1] 20.9	26.7	28.1	[1] 25.1	15.2	16.2	[2] 15.6	3.2	4.2	[1] 3.3
Denmark												
3rd week of Sept.	16.2	19.0	18.1	22.2	19.9	15.9	14.6	16.3	16.3	2.4	3.1	2.9
4st week of Sept.	17.0	20.1	19.1	21.5	18.5	15.5	15.1	16.9	16.6	2.6	3.4	3.2
1th week of October	18.2	—	—	21.8	—	—	15.3	—	—	2.8	—	—
Spain												
2nd week of Sept.	18.3	20.7	—	11.3	13.8	—	15.4	15.3	—	2.8	3.2	—
France												
3rd week of August	8.7	9.0	[2] 10.3	21.0	17.4	[2] 20.0	13.3	12.7	[2] 13.8	1.2	1.1	[2] 1.4
4th week of August	11.6	13.3	[2] 11.7	21.5	22.3	[2] 20.4	14.9	14.0	[2] 14.2	1.7	1.9	[2] 1.7
4th week of Sept.	19.2	17.8	[1] 17.0	22.0	21.2	[1] 19.5	16.7	17.2	[1] 16.1	3.2	3.1	[1] 2.7
Italy												
4th week of July	14.8	14.9	—	—	—	—	15.5	15.7	—	2.3	2.3	—
Slovakia												
2nd week of August	10.9	10.6	—	—	—	—	15.3	14.8	—	1.7	1.6	—

(1) Average to three years. — (2) Average to four years

In September, the weather was generally very warm and dry all over Europe, and was very favourable to crops in the regions where the soil was sufficietly humid. But where the soil had already been dried up by the long drought, the conditions of sugar beets became worse. The result of this situation was that the conditions of the crops varied much from region to region. It seems however, that the countries of central and northern Europe suffered less than those of the south of the continent where beets were still in the fields. Yet, information from the northern countries, while admitting that there was an improvement due to favourable weather in the month of September, does not indicate that this improvement was a neat one. In the Balkan countries, the drought still continued at the end of September. Seeing that the season was then already so advanced, further development of the beet plants seemed improbable even if rains had fallen.

As regards the general development of sugar beets in a good many beet producing countries of Europe, it appears that the weight of leaves is considerably above the average and very often even superior to last year; but this exceptional development of the leaves is not accompanied by a like growth of the roots which, in many cases, are very small. In the Balkan Stats roots did not reach their normal development rather on account of the drought than of a delay in the vegetation, and the leaves were not as luxuriant as in the countries of northern and central Europe. The percentage of sugar content was rather high, but generally lower than last year and especially than the average. Considering the weight of the roots and sugar content, the quantity of sugar per root is bound to be somewhat small. What has just been said, is not only referable to the countries that publish the results of sugar beet analyses (of which the following table sums up the results), but also to some other countries that do not analyse sugar beets regularly.

Acreage of Sugar-beet.

COUNTRIES	1942 (*)	1941	Average 1936 to 1940	% 1942: 1941 = 100	% 1942: Average = 100
	acres	acres	acres		
Belgium	(1) 126,752	119,727	121,686	106	104
Bulgaria	(2) 54,000	(2) 52,260	27,103	104	201
Croatia	13,600	(2) 21,333	(3) 15,365	64	88
Denmark	111,700	114,200	97,040	98	115
Spain	136,000	161,000	183,355	85	74
Finland	(1) 6,400	8,280	10,300	78	62
France	(1) 507,000	(1) 482,000	523,970	105	97
Hungary	(2) 161,000	(2) 200,000	122,519	81	131
Ireland	92,000	78,390	55,771	117	164
Italy	370,000	350,000	318,622	107	116
Latvia	(1) 50,000	(1) 30,881	32,979	160	150
Lithuania	(1) 35,290	(1) 36,041	22,220	98	159
United Kingdom	(2) 370,000	(2) 370,000	337,141	100	110
Serbia	(1) 31,600	(1) 35,410	82,594	89	—
Slovakia	40,000	47,000	(4) 39,199	84	101
Sweden	131,000	131,000	129,693	100	101
Switzerland	8,900	8,400	6,934	106	128
Turkey	(1) 77,000	(1) 101,000	74,271	76	103

(*) Approximate data — (1) Estimate of the International Association for Sugar Statistics. — (2) F. O. Licht's estimate. — (3) Year 1940. — (4) Average of two years.

Considering the conditions under which vegetation has taken place, delayed sowings (to which in some regions must be added a delayed growth as a consequence of cold weather at the beginning of summer), the scarcity of labour in some countries, the lack of fertilizers in some others, the insufficient development of the roots both on account of the drought and of cold spells, and the fact that the sugar content of the roots was often below that of 1941, it may be concluded that though the acreage to beets in 1942 was larger, sugar production in Europe will be somewhat smaller than in 1941.

The annexed table contains the data on acreage to sugar beets, with the addition of up-to-date estimates. The countries listed in this table are those for which it was possible to gather official or unofficial information. The total shows that the acreage to sugar beets, taken as a whole, is a little over one half of the entire European beet acreage, excluding the U. S. S. R. The total of the countries surveyed is only 1 per cent. above that of last year. It is possible that there was an increase also in the countries that do not publish agricultural statistics; but, as was said above, the increase of area will make up only in part for the gaps that have been noted. From the first communications received by the Institute about the probable production of beet sugar in the different European countries during the present season that has just begun, it may gathered that there will be a smaller production in most of the sugar beet producing countries. Naturally the estimates on production contained in the annexed table must be considered broadly approximate and certainly subject to modifications when more precise information will reach the Institute. This the more so, as this year, owing to the delay in the vegetation of the beets, the first information is less precise than ordinarily.

Production of Beet-Sugar (raw).

COUNTRIES	TOTAL PRODUCTION DURING THE SEASON						% 1942-43	
	1942-43 (1)	1941-42	Average 1936-37 to 1940-41	1942-43 (1)	1941-42	Average 1936-37 to 1940-41	1941-42 = 100	Average = 100
	thousand centals			short tons				
Belgium	5,291	5,467	5,229	260,000	273,000	261,426	97	101
Bulgaria	882	1,235	613	40,000	62,000	30,670	71	144
Denmark	4,960	6,151	5,019	248,000	308,000	250,954	81	99
Spain	3,086	3,550	3,155	150,000	177,480	157,748	87	98
Finland	121	91	255	6,100	4,557	12,741	133	48
Italy	9,480	10,064	9,613	470,000	503,200	480,642	94	99
Romania	926	1,342	2,559	46,000	67,090	127,957	69	36
Slovakia	1,213	1,494	(2) 1,299	61,000	74,710	(2) 64,929	81	(2) 93
Sweden	5,953	6,790	6,868	300,000	340,000	343,411	88	87

(1) Approximate data. — (2) Average of two years.

In Belgium, owing to damages caused by the drought, a small reduction of the production of sugar is foreseen, notwithstanding the increase of the area sown to this crop. Bulgaria reports a considerable reduction, compared with last year, because the size of the roots of this crop is quite small. The Institute correspondent in Denmark has just communicated that, according to the first estimate, the production of sugar in that country is 19 per cent. below that of last year. In fact, notwithstanding favourable weather in September, the crops have grown very little, and the weight of roots as well as sugar content per root are quite below last year and the average. The Spanish « General Association of Sugar Refiners » estimates that in Spain the reduction will amount to 13 per cent.

According to this estimate, production is not sufficient to cover 50 per cent. of the country's needs, and it may be that the proportion will be even smaller if, owing the the scarcity of fodder, a part of the beets are fed to livestock. In Finland, on the contrary, the Finnish Association of Sugar Refiners estimates that the production of sugar will be 1/3 over that of the previous season as a result of the improvement caused by fine weather during the latest weeks. In Italy, it is estimated that sugar production will be 6 per cent. below that of the 1941-42 season, owing to the fact that the formation of roots and their sugar content were not as good as last year. The Direction of Agricultural Economics of Romania estimates that the sugar production of the 1942-43 season will be about 1/3 below that of the year 1941-42. In Slovakia, production is expected to be 19 per cent. lower than last year; this decrease is almost in relation to the reduced acreage to sugar beets. From Sweden, the Swedish Cooperative of Sugar Factories has communicated to the Institute that the production of sugar this year is estimated at 12-13 per cent. below that of last year and the average. In France, on the contrary, according to a report from the "Groupe national specialisé de la betterave", although no figures are given, it is estimated that the production of sugar will be good. In fact yields of sugar beets appear bigger than in 1941 and their sugar content is very high. No figures on estimates are available for Germany, but information regarding production is good. In fact, Light reports that since the clearing of the economic space of Great-Germany, sugar beets have developped well and a good crop may be expected, notwithstanding the delayed and unfavourable start of the cultures. And if harvesting and refining are done regularly, the production of sugar will be entirely satisfactory.

The first estimates on the sugar beet production in extra-European countries indicate that in the United States there is going to be an increase of almost 30 per cent. over last year. In Turkey, on the contrary, the harvest of sugar beets indicates that the production of sugar will be small.

E. R.

CURRENT INFORMATION ON SUGAR.

Bulgaria: According to unofficial information, the harvesting of sugar beets had been started all over the country at the end of September. The volume of roots is about one third smaller than last year, but sugar contents are very high.

The 1942/43 sugar season began in the first days of October. All the sugar factories are working day and night. The factories of Plovdiv and Bourgas have also resumed their activity. For the first time in years, during this season 5 factories in Bulgaria wil be in full activity. The area to sugar beets has been increased and distributed according to the different regions in a rational way, so as to assure the delivery

of the sugar beets to all the factories of the country. Notwithstanding all these measures, home sugar requirements will be filled only by ⅔. The remainder will be made up with imports of sugar and saccharine.

Denmark: The condition of the sugar beet crop at Oct. 1, was quoted 90 against 88 at September 1.

France: The « Journal of Sugar Refiners » of Oct. 1, contained a detailed survey on the development of sugar beets in France in the year 1942 as had been ascertained by researches of the organising committee of the sugar beet industry. These researches had been carried on over 22 fields situated in the different beet-growing regions. In order to better illustrate the work, results were represented in diagrams which make it possible to follow the development of the plants during nine weeks. The report concludes that the development of sugar beets in 1942 shows great similarities with the year before. This is explained by the similarity of vegetative conditions. The situation may be considered good; but it must not be forgotten that the area sown to beets this year has been smaller than in the average of the preceding years. Moreover, in some regions the crop has been damaged by the larvae of pests, particularly the *Agrotis Segetum*.

Hungary: Towards the 3rd October, a heavy drought hindered the growth of sugar beets. Considering that the season is so advaced, a further development of the plants is doubtful even if it should rain. Roots are generally thin, but their sugar content is satisfactory.

Romania: According to unofficial information, an abundant sugarbeet crop is forecast in Transnystria.

Sweden: According to press reports, labour available for the harvest of the sugar beet crop is very scarce. The Committee of the Bourse du Travail, together with several other organisations, has called for volunteers to help in the gathering of sugar beets. Volunteers are offered all sorts of advantages as regards travelling expenses, food supplies etc. It must now be seen what results the appeal of the Committe is going to have. Up to September 20, the number of volunters that had reported to the Committee was estimated at 43,024.

Egypt: The production of canesugar in 1941-42 is estimated at 3,763,000 centals (188,000 sh. tons.) against 3,875,000 (194,000) in 1940-41 and an average of 3,316,000 (166,000) in 1935-36 to 1939-40; percentages, 97,1 and 113.5.

Reunion: The production of canesugar 1941-42 is estimated at 1,971,000 centals (99,000 sh. tons) against 1,613,000 (81,000) in 1940-41 and an average of 1,825,000 (91,000) in 1935-36 to 1939-40; percentages, 122,2 and 108,0.

Union of South-Africa: The production of canesugar in 1941-42 is estimated at 10,047,000 centals (502,400 sh. tons) against 12,731,000 (636,500) in 1940-41 and an average of 11,063,000 (553,200) in 1935-36 to 1939-40; percentages, 78.9 and 90,8.

WINE PRODUCTION IN 1942

by M. Costa

Both official and private information about the course of the wine season in the different countries gathered by the Institute up to the beginning of the month of October, is naturally less complete than ordinarily. It is such, however, as to allow the drawing of a sufficiently correct picture of the results of vintages in the most important wine producing countries of Europe and to get a general idea on the volume of world wine production in 1942. As it is known, the production of wine in the years 1940 and 1941 was very low, and international wine trade these last two seasons was seriously hindered thereby. Surplus stocks at the end of the present season will be very much reduced. Forecasts for the 1942-43 season are more favourable. Weather conditions in many countries were very good for vineyards: damages done by hail, frost and rain were generally limited, and attacks of animal and vegetal parasites did not cause grave preoccupations. During the summer, the weather was almost uninterruptedly fine; and although in some countries the drought was very persistent, dampness was avoided, which is far more feared by farmers than the drought, on account of the scarcity of anticryptogamic treatments.

Generally speaking, therefore, forecasts for 1942 are more favourable than they were for the production of 1941; and it is quite reasonable to expect that home consumption in the large wine producing countries, and international wine trade in 1942-43, will be more active than the year before.

Information by countries may be summarised as follows:

In *France*, flowering took place under quite satisfactory conditions: some damage was done, about the end of June, by hailstorms in some spots of large wine producing regions. During the months of July and August the condition of vineyards was good. The drought saved vines from cryptogamic maladies. Towards the middle of September, vintages were favoured by very fine weather. Early estimates point to a production of about 1,100 million Imp. gallons (1,300 million Amer. gallons), against 935 million Imp. gallons (1,100 million Amer. gallons) in 1941 and 985 million Imp. gallons (1,180 million Amer. gallons) in 1940. The production of 1942 would be considerably below average. In the 1941-42 season, France could only count on about 660 million Imp. gallons (800 million Amer. gallons) for taxed consumption; which means a reduction of 440 million Imp. gallons (520 million Amer. gallons) over a normal year. Consumption had to be rationed from the beginning of the season. At the end of September, nothing was yet known about the measures for the supply of wines of the 1942 vintage. It seems, however, that they will be similar to those that were adopted last year at the same time.

In *Italy*, the long drought has improved the quality of raisins: attacks of mildew have been reported in some regions. Very recent forecasts point to a somewhat higher production than in 1941, which amounted to about 790 million

Imp. gallons (950 million Amer. gallons). The wine market will be ruled by the new regulations which require that wine producers declare the amount of their production within November 20. The quantities of must and raisins will be transformed into wine according to the following coefficients: 220 lb. of must or of sweet filtered must = 20 Imp. gallons (24 Amer. gallons) of wine; 220 lb. of concentrated must = 59 Imp. gallons (71 Am. gallons) of wine; 220 lb. of grapes = 14 Imp. gallons (17 Am. gallons) of wine. In order to insure the quantities of wine needed for the army and distillation, the same decree calls for the obligatory preservation of 20 per cent. of total production at the producers's warehouses. The rest can be sold on the free market. Other regulations deal with the classification of wines and prices.

In *Spain* the condition of vineyards was generally good; the summer drought preserved raisins from the attacks of mildew. In the Spring, hailstorms in some spots caused some damage of slight importance. The production of must in 1942 is estimated at about 370 million Imp. gallons (450 million Amer. gallons). This production is bigger than that of 1941: the quality is very good. At the end of September, very fine yields were expected in the regions of Levante and Castille; good yields in Andalusia, Arragon, High Ebro, and Central Region. In some zones of north-western Spain, yields seemed very low. In the important province of Valencia, the situation appeared extremely favourable. Yields in the wine producing zones of the provinces of Ciudad Real, Toledo and Barcelona were average.

Wine production in the three most important wine producing countries.

(Million Imp. Gallons and Million Am. Gallons).

	France	Italy	Spain
Average 1924/28	1,276 (1,532)	922 (1,107)	453 (544)
,, 1929/33	1,194 (1,434)	845 (1,014)	442 (531)
,, 1934/38	1,377 (1,654)	836 (1,004)	(¹) 330 (396)
Year 1940	985 (1,180)	666 (800)	308 (370)
,, 1941	935 (1,100)	* 790 (950)	352 (423)
,, 1942 *	1,100 (1,300)	836 (1,004)	370 (450)

* Unofficial estimates. — (¹) Broadly approximate estimates.

As regards the European wine producing countries of lesser importance, it is known that in *Romania*, after two consecutive years of very poor yields, the wine season has been satisfactory. In Portugal, towards the end of September, production was estimated average, viz., 155-180 million Imp. gallons (185-210 million Amer. gallons). This is a higher figure than the very low one of the year 1941. But, owing to heavy rains and windstorms at the beginning of October, which have done considerable damage to vineyards in some important wine producing regions, this estimate must be reduced. Rainfalls at the time of vintage after a long period of drought, may affect badly the quality of wine.

In *Greece*, it seems that vintages gave satisfactory results; but further information on the course of the season is lacking.

In *Hungary*, the development of vineyards during the summer was favourable; mildew appeared in all the wine producing regions of the country, without however causing serious damages. In some places, the drought dried the grapes. Wine production is estimated at between 99 and 110 million Imp. gallons (120 and 130 million Amer. gallons).

In *Germany*, forecasts are for average yields. Vineyards show no signs of important damage, except in some zones of the Danube and of the Rhine hit by hailstorms and invaded by mildew. It is expected that German importations of raisins from France, Italy and Bulgaria during the season 1942-43 will be bigger than in previous years.

The situation in *Bulgaria* and in *Switzerland* at the end of September was good. It seems however that in Switzerland the production of wine will not be as high as in 1941. Total production, in fact, is estimated at about 17 million Imp. gallons (20,5 million Amer. gallons), against 18,7 million Imp. gallons (22,5 million Amer. gallons) in 1941. The quality of the wine is good. Fine yields are expected also in the wine producing regions of *Serbia*. Production in *Slovakia* is estimated at 4,4 million Imp. gallons (5,3 million Amer. gallons).

In North Africa, *Algerian* production is estimated slightly lower than average, namely (330 million Imp. gallons (395 million Amer. gallons). Vineyards suffered from the summer drought, and the quantity of copper generally used against mildew was not sufficient. Attacks of oïdium were reported from the damp regions of the litoral and from mountaineous zones. At the end of Summer, forecasts for wine production in *Tunisia* were favourable.

Information about the course of the wine season in the wine producing countries of the Southern hemisphere (Argentina, Chili, Brazil, Uruguay, Union of South Africa and Australia) as well as in the United States of America and some lesser important Asiatic and African countries (Turkey, French Morocco) is lacking. The production of wine in these countries taken together averages only from 5 to 10 per cent. of world total.

World wine production.

(Million Imp. Gallons and Million Am. Gallons).

Average 1924/28	3,847 (4,620),	of which in Europe [1]	3,269 (3,926)
„ 1929/33	3,999 (4,803)	„ „	3,247 (3,899)
„ 1934/38	4,331 (5,201)	„ „	3,423 (4,110)
Year 1940	3,300 (3,963)	„ „	2,640 (3,170)
„ 1941	3,553 (4,266)	„ „	2,783 (3,342)
„ 1942 (estimated) .	3,850 (4,625)	„ „	3,100 (3,700)

[1] Including the U. S. S. R.

Summing up, according to the information (uncomplete, in some cases) gathered to date by the Institute, the estimate of the world wine season points to a production of 3,850 millions Imp. gallons (4,625 millions Am. Gallons). Euro-

pean production is estimated at 3,100 millions Imp. gallons (3,700 millions Am. gallons). This figure is considerably higher than the figures of the 1941 and 1940 productions; but it is still quite below average. Total figures for 1942 are provisional and must be considered susceptible of revision. By these figures, world wine production would appear 8 per cent. higher than in 1941, 17 per cent. above the very poor one of 1940, but 11 per cent. below the average for the years 1934 to 1938.

Alcohol content is generally high.

CURRENT INFORMATION ON OLIVES.

Greece: The production of olive oil in the 1942-43 season does not seem to be very abundant. According to unofficial information, it may amount to 1,764,000 centals or 23,500,000 gallons, which is about the same as last year. It is forecast that continental Greece will contribute to this production about 1,102,000 centals or 14,710,000 gallons, the Island of Crete 550,000 centals or 7,350,000 gallons, and the other islands (especially the Jonian islands) will provide the rest. The low production of the last two seasons (which was much below the average of the last ten years before the beginning of the present war) must be attributed mostly to the damages caused to olive trees by the latest war operations.

FORECASTS ON WORLD LINSEED PRODUCTION IN 1942-43

By A. Di Fulvio.

The official and press information that the Institute could gather this year on the 1942-43 linseed crop in the different flax producing countries of the world, is not as complete as in normal times. Yet it is enough to allow the sketching of the main characteristics of the present linseed season, and also to broadly figure out the probable results of harvests in the world chief producing countries.

The war has deeply upset the international trade of this oleaginous product which, for its oil, finds an increasing use in the aero-naval industries of the belligerent countries. Many large exporting countries, such as Argentina, have been obliged to considerably reduce their production of linseed, while most of the European and extra-European importers have favoured its increase by the adoption of many emergency legislative and economic measures.

The condition of the crop in its different vegetative phases and the results foreseen in the most important producing countries during the present season, may be summed up as follows:

In *Argentina*, which holds the first place among linseed producers and exporters, plowing and sowing were hindered by an intense drought that lasted until

the month of July. Germination was delayed and, in some places, seeds were utterly lost. August rainfalls over the most important producing centers of the country improved the situation considerably. This improvement continued in September and October. The latest telegraphic reports, sent by the Argentine Ministry of Agriculture to the Institute, point to a normalisation of crops conditions which, in the country as a whole, were considered good or excellent at the end of October. The first official estimate on the area sown to linseed in 1942-43, which was published in August, registered a reduction of about 10 per cent. over the already reduced acreage of the year 1941-1942. The reduction, compared with the average of the five previous years, amounted to 17 per cent. On October 23, the Argentine Government wired the Institute a new estimate (6,005,000 acres) which is slightly below the preceding one. This is the smallest acreage since 1923-24, 11 per cent below that of 1941-42 and 18,4 per cent. below the average of the preceding five years.

Area, Production and Yield of Linseed in Argentina.

YEARS	AREA			PRODUCTION			
	sown	harvested	% of sown area harvested	total		per acre harvested	
	1,000 acres	1,000 acres	%	1,000 centals	1,000 bush.	centals	bushels
1942-43	6,005	...	...	...	...	...	...
1941-42	6,746	...	...	35,274	62,990	...	...
Aver. 1936-37/1940-41.	*7,354*	*6,177*	*84.3*	*32,680*	*58,357*	*5.3*	*9.4*
1940-41	6,760	6,178	91.4	32,179	57,462	5.2	9.3
1939-40	7,600	5,602	73.7	22,364	39,935	4.0	7.1
1938-39	6,689	5,787	86.5	31,085	55,510	5.4	9.6
1937-38	7,077	5,691	80.4	34,167	61,013	6.0	10.7
1936-37	8,646	7,626	88.2	43,605	77,867	5.7	10.2
Aver. 1931-32/1935-36.	*7,515*	*6,449*	*85.8*	*39,518*	*70,567*	*6.1*	*11.0*
1935-36	6,573	5,604	85.3	33,290	59,446	6.0	10.7
1934-35	8,103	7,104	87.7	44,644	79,721	6.3	11.2
1933-34	6,855	4,878	71.2	35,054	62,596	7.2	12.8
1932-33	7,401	6,395	86.4	34,723	62,005	5.4	9.7
1931-32	8,641	8,263	95.6	49,878	89,067	6.0	10.8

The considerable reduction registered this year is mostly the consequence of the great difficulties that the state of war put in the way of exports causing the accumulation of considerable amounts of surplus stocks of the last two seasons all over the country.

The results of the present season are strictly subordinated to the more or less favourable trend of weather conditions up to the month of December when harvesting will be at its full. As a matter of fact, from now until December, the flax crop is in the most critical stage of its vegetative cycle. On the basis of acreage sown and an average yield which excludes occasional damages, the

Argentine linseed production in 1942-43 may be broadly estimated lower than that of the last season (35,274,000 centals or 62,990,000 bushels), but it will be very near the average of the five preceding years (32,680,000 centals or 58,357,000 bushels)

In Europe, not including the U. S. S. R., the flax crop is the most widely distributed among the oleaginous herbaceous plants, but its relative importance as compared with the total acreage sown to this crop in the the world, is very small. In fact the average area sown to this crop in the period 1934-38 (which was over 1/3 higher than the average of the five preceding years) amounted to hardly 8.9 per cent of world total, not including the Soviet Union. Linseed production, which in the period 1934-38 had been estimated at about 4,850,000 centals or 8,661,000 bushels, in comparison with world total, amounted to only 8 per cent. On the other hand, Europe, in normal times, was at the top of all the other continents as an importer of linseed. Apparent consumption of the years 1934 to 1938, adding import surplus to the production of the continent, amounted to about 34,833,000 centals or 62,202,000 bushels, equivalent to 57 per cent. of world total, not including the U. S. S. R.

In the course of recent years, the European countries, which, on account of the war could no further import any linseed from their ordinary overseas supply centers, have attempted by all means to increase to the utmost the production of this oleaginous crop. The agricultural plans prepared by the different countries for the year 1942 included as a rule, a considerable increase of the acreage ordinarily destined, in Europe, to the production of fibre and linseed. Let us now examine the condition of the flax crop in the different European countries for which information is available:

In *France* the area sown to linseed in 1942 seems to have amounted to 93,000 acres. This means an increase of 63 per cent. over the year 1941 and 4.3 per cent. compared with the average of the five preceding years. According to press information, production was abundant and quality was good.

In *Estonia* the acreage set by the plan (74,000 acres) means an increase of 30.4 per cent over last year.

Information regarding *Lithuania* and *Latvia* is more vague, but it shows that in these two countries too there has been an increase of acreage to linseed over last year.

In *Romania* the plan of sowings for the year 1942, foresaw the increase of the acreage to flax of 600 per cent. over last year, when it had already been increased 250 per cent., as compared with the year 1940. Adverse weather conditions, however, which prevailed during the sowing period, made it impossible to fully execute the plan. Moreover, yields were unsatisfactory, because the development of the plants was hindered by rather bad weather.

In *Hungary*, the Government, in order to intensify the crops of oleaginous plants, has obliged the farmers that dispose of over 72 acres of arable land, to grow this year, as their main crop, either linseed or sunflower on 5 per cent. of their available arable land. The proportion of 5 per cent. is reduced to 2 per cent. for farmers that own over 714 acres of arable land; but in such case, they must also cultivate 2 per cent. of their land to castor-oil.

Thanks to these legislative and economic measures (reductions of purchase price of necessary seeds, granting of loans without interests, etc.), the crop of linseed in 1942 has been strongly increased. Weather conditions in some regions were unfavourable to the crop which appeared thin and infested by weeds. Yet, taking the country as a whole, the results of threshing were satisfactory.

In *Italy* the season was not good: too much rain during sowing and the long Summer drought caused quite heavy damages in the most important zones of production.

In *Bulgaria*, the area actually sown to flax was 58 per cent. above the acreage foreseen by the plan. But in this country too the weather was not favourable, and the crop was damaged by the drought.

In *Serbia* there has been a big increase of the area sown to this crop.

No special information is available for the other European producing countries. But it is quite reasonable to think that following the tendency to an increase which has been noticeable for some years, especially in *Germany* and in the occupied Eastern territories, the acreage to flax has been further increased in 1942.

As regards the *U. S. S. R.*, no information is available on the results obtained this year. All that can be done, therefore, is to deal with some general characteristics of the crop. The geographic distribution of flax differs according to varieties. The variety « Dolgunetz », that is by far the most important one and serves both to the production of fibre and seed, is chiefly cultivated in the territories of European Russia. In fact, nearly 50 per cent. of this variety are concentrated in the federal provinces of Kalinine and Smolensk and in the two republics of White Russia and Ukraine.

Almost 2/3 of the " Kudriache " variety, which is grown only for seeds, is cultivated in the black lands of Ukraine and in the province of Stalinegrad.

The mention of these lands, which as far as it is known, are now mostly occupied by the German army, gives a sufficiently clear idea of the potential amounts of linseed at the disposal of the European continent. Soviet production in recent years amounted to about 16,535,000 centals (29,526,000 bushels) of linseed that were almost entirely consumed in the country itself.

In *North America*, both the United States and Canada increased their production in 1942. The total area to linseed in these two countries has almost trebled as compared with the average of the five year period ending in 1940.

Owing to the great increase of acreage and favourable weather, the production of the United States has reached a higher level than ever before: it was in fact, 1/3 bigger than the excellent crop of last year which was the biggest in the last 40 years. This year production covers plentifully the normal linseed oil needs of the country; consumption in the two five year periods ending in 1933 and 1938 absorbed respectively 14,110,000 centals (25,196,000 bushels) and 14,551,000 (25,983,000) of linseed.

No official information is available regarding *India*. It seems, however that in 1942 no appreciable changes have taken place in this culture, as compared with preceding years.

Area and production of linseed in United States and Canada.

Area.

(in 000 acres)

	1942	1941	Average 1936/1940	% 1942: 1941 = 100	% 1942: Average = 100
United States	4,400	3,228	1,695	136.3	259.4
Canada	1,480	958	326	154.0	451.7
Total	*5,880*	*4,186*	*2,021*	*140.6*	*291.1*

Production.

		1942	1941	Average 1936/1940	% 1942: 1941 = 100	% 1942: Average = 100
United States	(000 centals)	23,520	17,640	8,051	133.3	292.1
	(000 bushels)	42,000	31,500	14,377		
Canada	(000 centals)	1) 5,512	3,624	1,014	152.1	543.5
	(000 bushels)	1) 9,842	6,472	1,811		
Total	(000 centals)	*29,032*	*21,264*	*9,065*	*136.5*	*320.2*
	(000 bushels)	*51,842*	*37,972*	*16,188*		

(1) Unofficial estimate.

* * *

Summing up, the tendency to a progressive extension of the linseed culture that had been noticeable for several years, has continued during the present season in Europe and has reached a level never known before, in North America. On the other hand, a considerable regression has been registered in Argentina, under the weight of the heavy surplus stocks, which, on account of the war, have accumulated in the country during the last two years.

In India, where this crop is quite stable, no changes worthy of mention seem to have taken place.

Yields obtained in Europe were greater than last year, but the increase has not been in proportion with the increase of acreage, because weather conditions that prevailed over the continent as a whole, were rather unfavourable to the crop.

North America, on the contrary, just also on account of favourable weather, has registered a record crop.

Harvest forecasts in Argentina at the of October were excellent; but owing to the reduction of cultivated acreage, only an average production is to be expected.

Trade outlooks, especially as concerns the exportation of Argentine linseed in 1943 are, at the present time, quite bad. The only large importing markets that could absorb a part of the considerable surpluses of Argentina are the United States and England. But it is probable that the United States, that registered an exceptionally high production which is abundantly sufficient for the normal needs of the country, will keep their purchases stricktly within the limits of the exceptional needs of. their war industries.

British demand might reach a rather high level; but it is subordinated to available tonnage and, in general, to the risks of sea transports in war times.

CURRENT INFORMATION ON FLAX.

Finland: According to press reports, the culture of flax in Finland has been further increased. In the South and West have been sown to this crop 1000 acres in experimental fields. Good yields have been obtained. Bast production this year is estimated at about 13,000 centals, dried in the barn.

Argentina: According to the third official estimate, the area sown to linseed in 1942-43 was a little smaller than had been estimated before. It is now set at 6,005,000 acres, against 6,746,000 acres in 1941-42 and 7,354,000 acres in the five preceding years. Percentages: 89.0 and 81.6.

(Telegram of October 30). The condition of the linseed crop is excellent.

CURRENT INFORMATION ON COTTON.

Bulgaria: The "*Direction for the purchase and importation of cereals*" which is also charged with the monopoly of cotton, towards the end of September gave orders to its agents to begin purchasing cotton in all the cotton producing regions of the country. After the very small harvest of the year 1941, when the cotton crop was damaged by frequent rains during the time of ripening and opening of the seeds, the average yield of cotton this year seems particularly high. It is forecast that, owing to the increase of areas which in 1941 had already been brought up to 173,000 acres (including the annexed regions) and thanks to high yields, the productiou of ginned cotton this year may amount to 264,500 centals (55,300 bales). The Government is following with the utmost attention this increased interest in the cotton crop this year also.

Romania: About October 10, 70 per cent. of cotton had been picked up. Production is satisfactory both as regards quality and quantity.

Egypt: The first official estimate of the 1942 cotton crop in Egypt, issued as usually on the first Monday of October, amounts to about 721,000 bales of 478 lb. net weight, compared with 1,672,000 bales last year and 1,922,000 bales on the average of the 5-year period 1936 to 1940; percentages: 43.1 and 37.5. This year's cotton crop is the smallest picked in Egypt since 1890, while the fine crops from 1936 to 1940, which constitute the average, have been the most abundant ever cultivated. This is why in comparing the two figures the difference is so wide. The average yield of cotton lins per acre is estimated now of 473 lb., against 468 last year and 505 on the average from 19 to 1940.

CURRENT INFORMATION ON HEMP.

Romania: According to information from the Bureau of Textile Plants of the Ministry of Agriculture, hemp had been sown this year over large areas and the production of seeds was good both as to quantity and quality.

CURRENT INFORMATION ON OTHER PRODUCTS.

Coffee.

Angola: According to press information the 1941-42 production of coffee in the Portuguese colony of Angola amounted to 524,000 centals against 441,000 centals in 1940-41.

Colza and sesame.

Hungary: Owing to the drought, the sowing of Autumn colza has been done with great difficulty. In some places, by October 3, sowings were not over yet. There are places where colza that had been sown in August, had not germinated by the beginning of October and here and there, germination was defective. In warmer soils, colza seeds are drying up.

Sunflower.

Hungary: At the beginning of October, the gathering of sunflowers had been started. Dry, warm weather has hastened the ripening of the crop.

CURRENT INFORMATION ON FODDER CROPS.

Denmark: At October 1, the condition of the chief forage crops compared with September 1, was as follows: mangels 87 (85) cabbages 96 (94), turnips 94 (94), lucerne 96 (96), pastures 86 (83).

Finland: According to press information, the production of fodder will be good.

Hungary: Owing to drought, at the beginning of October the development of clover and lucerne had stopped. Natural meadows and pastures also suffered from want of rains.

Ireland: According to the latest Report on the Agricultural condition arrived from Dublin, area sown to turnips in 1942 amounted to 144,300 acres, against 157,000 in 1941 and 146,800 on the average during the five years 1936 to 1940; percentages: 91.9 and 98.3. Production in 1941 was estimated at 58,947,000 centals (2,947,000 short tons) and 57,908,000 (2,895,000) on the average. Area sown to mangels was estimated at 83,000 acres, against 96,000 in 1941 and 87,100 on the average 1936-40; percentages: 86.5 and 95.3 Production in 1941 and on the average 1936-40 amounted respectively to 39,429,000 centals (1,971,000 short tons) and 36,743,000 (1,837,000).

Production in 1942 of both turnips and mangels has not been satisfactory, owing principally to drought. Figures have not yet been received.

Romania: Owing to the drought, forage crops appear very small in several regions of the country. Agricultural authorities are advising farmers to spare forages as much as possible. The Ministry of Agriculture has even allowed the gathering of leaves in the woods under the control of forestry experts.

Argentina: (Telegram of October 30). The condition of pastures is considered satisfactory.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Bulgaria: The Ministry of Agriculture has prepared a plan to encourage aviculture. Measures have already been taken by the Ministry to help the purchase of incubators by the cooperatives of aviculturists. Moreover, about 15,000 cocks have been distributed among aviculturists in sixty villages.

Ireland: Preliminary figures for June, 1942, of the annual census of livestock, indicate that the number of cattle in the country was maintained at a satisfactory level compared with 1941 despite the increase of 17.3 per cent. in the tilled areas. The numbers of breeding and young stock were practically unchanged but there were slight reductions in the numbers of other cattle one year old and over. Sheep decreased by over 7.5 per cent. and pigs by nearly 33 per cent.

CURRENT INFORMATION ON SERICULTURE.

Bulgaria: According to information by the General Direction of Statistics, cocoon production of the 1941 season was a poor one. It amounted, in fact, to 4,000,000 lbs. in Bulgaria (ancient frontiers) against an average of 5,000,000 lbs. in the three previous years (1938-1940). Yet, the 1941 production of cocoons is considerably higher than the average for the years 1933 to 1937 (3,000,000 lbs.). According to the same source, the regions of Bitolia, Scoplje, the Aegean sea and Dobruja produced, in 1941, about 1,300,000 lbs. of cocoons.

TRADE

SPAIN: (January 1st-December 31; 1941 and 1940).

Products and Units		Exports 1941	Exports 1940	Imports 1941	Imports 1940
Wheat	1,000 centals	35	138	9,889	14,860
»	Thous. bush. of 60 lb.	58	230	16,481	24,766
Wheat flour	1,000 centals	360	509	186	687
» »	Thous. bbl. of 196 lb.	184	260	95	350
Rye	1,000 centals	—	1	44	13
»	Thous bush. of 56 lb.	—	2	78	23
Barley	1,000 centals	0	61	34	128
»	Thous. bush. of 48 lb.	1	127	71	267
Maize	1,000 centals	5	17	5,653	706
»	Thous. bush. of 56 lb.	9	30	10,095	1,261
Rice	1,000 centals	58	236	354	1,218
»	Thous. bush. of 45 lb.	129	525	786	2,708
Linseed	1,000 centals	0	0	132	78
»	Thous. bush. of 56 lb.	0	0	237	140
Cotton	1,000 centals	2	1	1,153	1,637
»	Thous. bales of 478 lb.	0	0	241	342
Wool	1,000 lb.	1,217	831	256	37
Butter	» »	139	134	7	2
Cheese	» »	21,530	10,395	1,832	917
Cacao	» »	—	—	24,890	34,765
Coffee	» »	—	—	17,692	13,459

SWEDEN: Imports.

Products and Units		August 1942	August 1941	Total from the beginning of the season *) 1942	Total from the beginning of the season *) 1941	Total of the season *) 1941-42
Wheat	1,000 centals	424	0	424	0	781
»	Thous. bush. of 60 lb.	706	0	706	0	1,302
Rye	1,000 centals	4	0	4	0	286
»	Thous. bush. of 56 lb.	7	0	7	0	511
Oats	1,000 centals	33	1	33	1	163
»	Thous bush. of 32 lb.	103	2	103	2	511

CHILE: Exports.

During the month of July 1942 wool exports have been of 106 Thous. lb.

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat, wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao; November 1st for maize.

PORTUGUESE GUINEA.

Products and Units	April 1942	April 1941	Total from the beginning of the season *) 1942 or 1941-42	Total from the beginning of the season *) 1941 or 1940-41	Total of the season *) 1941 or 1940-41
Imports.					
Wheat flour . . . 1,000 centals	0	0	2	1	1
» » . . . Thous. bbl. of 196 lb.	0	0	1	0	1
Butter . . . 1,000 lb.	4	4	11	13	24
Cheese . . . » »	0	2	0	4	15
Exports.					
Rice . . . 1,000 centals	1	16	6	32	115
» . . . Thous. bush. of 45 lb.	1	36	14	71	256

MOZAMBIQUE.

Products and Units	March 1942	March 1941	Total from the beginning of the season *) 1942 or 1941-42	Total from the beginning of the season *) 1941 or 1940-41	Total of the season *) 1941 or 1940-41
Imports.					
Wheat flour . . . 1,000 centals	...	14	144	101	149
» » . . . Thous. bbl. of 196 lb.	...	7	73	52	76
Rice . . . 1,000 centals	...	26	46	42	176
» . . . Thous. bush. of 45 lb.	...	57	103	94	391
Butter . . . 1,000 lb.	...	49	139	181	648
Cheese . . . » »	...	26	46	57	225
Coffee . . . » »	...	37	384	...	...
Exports.					
Tea . . . 1,000 lb.	...	154	540	...	...

ANGOLA.

Products and Units	January 1942	January 1941	Total from the beginning of the season *) 1942 or 1941-42	Total from the beginning of the season *) 1941 or 1940-41	Total of the season *) 1941 or 1940-41
Imports.					
Butter . . . 1,000 lb.	4	0	4	0	44
Cheese . . . » »	2	7	2	7	68
Exports.					
Maize . . . 1,000 centals	454	319	851	632	3,647
» . . . Thous. bush. of 56 lb.	811	569	1,520	1,128	6,513
Rice . . . 1,000 centals	6	1	6	1	46
» . . . Thous. bush. of 45 lb.	13	1	13	1	102
Coffee . . . 1,000 lb.	847	51	21,504	6,587	17,174

*) See note page 359.

CAPE VERDE ISLANDS: Exports.

Products and Units	August 1941	August 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940 or 1940-41
Wheat flour . . . . 1,000 centals	2	1	17	7	19
» » . . . . . . Thous. bbl. of 196 lb.	1	0	8	4	10
Rice . . . . 1,000 centals	2	0	45	17	—
» . . . . Thous. bush. of 45 lb.	4	0	99	38	—
Coffee . . . . 1,000 lb.	9	4	26	26	...

PORTUGUESE INDIA: Imports.

Products and Units	October 1941	October 1940	Total from the beginning of the season *) 1941	Total from the beginning of the season *) 1940	Total of the season *) 1940-or 1940-41
Wheat . . . . 1,000 centals	3	5	13	20	67
» . . . . Thous. bush. of 60 lb.	5	9	21	34	112
Wheat flour . . . . 1,000 centals	4	4	12	13	42
» » . . . . . . Thous. bbl. of 196 lb.	2	2	6	6	22
Maize . . . . 1,000 centals	2	1	2	1	20
» . . . . Thous. bush. of 56 lb.	4	2	4	2	36
Rice . . . . 1,000 centals	34	23	461	478	543
» . . . . Thous. bush. of 45 lb.	75	51	1,024	1,063	1,208
Butter . . . . 1,000 lb.	24	26	317	313	337
Tea . . . . » »	7	11	29	49	106

*) See note page 359.

PRICES BY PRODUCTS.

Quotations for future delivery.

Description	Oct. 16, 1942	Oct. 9, 1942	Oct. 2, 1942	Sept. 25, 1942	Sept. 18, 1942	Monthly averages: Sept. 1942	Oct. 1941	Oct. 1940	Oct. 1939	Oct. 1938
Wheat.										
Winnipeg (cents p. 60 lb.):										
delivery October	90	90	90	90	90	90	73 7/8	70 1/4	70 3/8	60 3/8
„ December	90 1/2	90 3/4	91 1/4	91 1/4	—	—	74 7/8	71 5/8	71 1/8	60
„ May	—	—	—	—	—	—	78 1/4	75 7/8	76 3/4	63 3/8
Chicago (cents p. 60 lb):										
delivery September	—	—	—	—	123 1/2 *	122 1/8	—	—	—	—
„ December	123 3/4	125 1/2	128 1/2	128 3/8	126 1/2	126 1/8	116 1/8	84 5/8	84 1/8	65 1/8
„ May	126 1/4	128 1/4	131 1/4	131 5/8	129 3/4	129 5/8	119 3/8	83 1/4	83 3/8	66 3/4
„ July	127	128 7/8	132 1/4	132 1/8	—	—	119 3/4	79 1/4	81 7/8	66 1/8
Rye.										
Winnipeg (cents p. 56 lb.):										
delivery October	55 7/8	56	58	60 3/8	60 1/2	58 1/8	57 5/8	43 5/8	60 1/8	41 3/8
„ December	56 5/8	56 5/8	59	61 1/8	61 1/2	59	57 1/8	44 7/8	57 1/8	41
„ May	58 7/8	59	61 1/8	63 3/8	63 1/2 *	63 3/8	59 5/8	47 5/8	58 5/8	43
Chicago (cents p. 56 lb.):										
delivery September	—	—	—	—	71 5/8 *	67 1/2	—	—	—	—
„ December	65 3/4	68	71	73	75 1/8	71 5/8	67	45 1/8	53 3/4	43
„ May	71 5/8	73 3/4	76 3/4	78 3/4	80 7/8	77 3/8	73 1/4	48 3/4	54 3/8	44 1/8
„ July	73 3/8	75 5/8	78 1/8	80 3/8	—	—	75 1/8	49 3/8	54 1/4	—
Barley.										
Winnipeg (cents p. 48 lb.):										
delivery October	60 7/8	60 5/8	60 7/8	60 3/4	60 3/4	60 7/8	56 7/8	39 7/8	42 5/8	36 7/8
„ December	60 3/8	60 1/4	60 3/4	60 3/4	60 1/2	60 3/4	56 1/8	39	47 3/8	35 5/8
„ May	60 7/8	61	61 7/8	—	—	—	56 5/8	39 3/8	43 1/4	36 7/8
Oats.										
Winnipeg (cents p. 34 lb.):										
delivery October	46 7/8	47 5/8	47	48 3/4	46 1/2	47 7/8	46 3/4	33	32 3/4	28 3/8
„ December	45 3/8	45 1/2	45 5/8	46 1/8	45 3/4	46 1/8	45 5/8	30 1/4	31	27 5/8
„ May	45 3/4	46	46 7/8	48 1/8	—	—	44 7/8	30	31 1/8	28 7/8
Chicago (cents p. 32 lb.):										
delivery September	—	—	—	—	49 7/8 *	50 1/8	—	—	—	—
„ December	47 7/8	50	51 3/4	52 1/2	51 7/8	51 7/8	49 1/8	33 5/8	34 1/8	25 1/8
„ May	50 5/8	52	53 3/4	54 3/8	54 1/8	53 7/8	51 3/8	33 1/4	33 7/8	26
Maize.										
Chicago (cents p. 56 lb.):										
delivery September	—	—	—	—	82 7/8 *	83 1/4	—	—	—	—
„ December	80 1/4	81 3/4	85 1/4	86 1/8	85 3/4	86	77 1/4	60	49 3/8	45 5/8
„ May	85 1/4	86 1/4	89 7/8	90 1/8	89 3/4	90	83	61	52 3/8	48 3/4
„ July	87 1/8	87 7/8	91 1/8	91 7/8	—	—	84 7/8	61 1/4	53 1/4	50 1/4
Linseed.										
Winnipeg (cents per 56 lb.):										
delivery October	164	164	164	164	164	164	151 5/8	—	167 7/8	133 1/8

* Indicates that the product was not quoted during part of the period under review.

DISTRIBUTION OF HORSES ACCORDING TO AGE, SEX AND DESTINATION

by VALENTINO DORE

This article, dealing with the question of the classification of horses, completes the series of studies on the classification of the various kinds of livestock in the statistics of the different countries.

As was already said in the articles published in the issues of June, July-August and September of this Bulletin, about the classifications of oxen, pigs and sheep, these surveys on some particular aspects of the problem of the improvement and unification of agricultural statistics, aim at the creation of a preliminary basis for the discussions that official statisticians of the different countries may be called to undertake, as soon as conditions will allow, for an international solution of this problem.

I. — The standard form contained in the programme of the World Agricultural Census of 1940 and elaborated by the two Conferences of Agricultural statisticians which were held in Rome, by the initiative of the International Institute of Agriculture, in October 1936 and December 1937, recommended the adoption of the following categories for the classification of horses:

Colts and fillies under 1 year of age;
Young stock of 1 and less than 3 years of age;
Entire horses 3 years of age and over;
Mares 3 years of age and over;
Geldings 3 years of age and over.

Moreover, the same Conferences expressed their opinion that it is desirable:

(1) to classify separately males and females both as regards the category of animals under 1 year and that of young stock of 1 and less than 3 years of age;

(2) to subdivide entire horses 3 years of age and over, into two groups, those for breeding and those not for breeding;

(3) to subdivide into age groups entire horses, mares and geldings 3 years of age and over.

II. — Before taking up the question of how far the details furnished by the statistics of a number of countries correspond to the minimum classification recommended by the Institute, and whether at the same time they make it possible to realise the supplementary desiderata formulated by the two Conferences of agricultural statisticians, some reasons must be mentioned (besides classification differences) for which the statistics of horses of the different countries are not exactly comparable.

One of these reasons may be the difference of the time at which the surveys take place, although generally the fact that they are not taken at the same time is not sufficient to seriously compromise the value of international comparisons,

because the number of horses is not subject to the heavy variations of a seasonable character that occur in the cases of other kinds of livestock. The U. S. S. R. is the only country where horse censuses are taken twice a year. Statistics in that country show that in the years 1934 to 1938 the total number of horses in the month of January was about 3-4 per cent. lower than in the month of July of the preceding year.

Another element unfavourable to international comparisons is that some countries only register farm horses, or horses existing in rural communes, thus practically excluding from the count the horses of urban centers. The relative importance of the number of horses that are not included in the surveys in such cases, naturally varies according to countries. Sometimes the difference is not so great as to seriously affect the comparisons between the results of these uncomplete statistics and those of the countries where all horses are included; but in other cases the difference between the number of horses at the farms etc., and the totals is quite considerable.

For some countries where details normally available or occasional special censuses make it possible to exactly establish the relative importance of farm horses (or of the horses existing in the rural communes) in relation to the total number of horses, we possess the following indications:

I. — *Proportion of farm horses (or of horses in rural communes) as compared with the total number of horses.*

Country	Date		Farm horses etc.	Total number of horses	% of farm horses etc. in proportion to the total number of horses
Belgium	Dec. 1929	a)	269,792	320,336	84.2
Denmark	July 1933	b)	501,080	519,664	96.4
Estonia	June 1929	c)	200,630	205,448	97.7
France	Nov. 1929	c)	2,887,438	3,135,609	92.1
Ireland	June 1939	d)	415,998	445,048	93.5
Norway	June 1929	b)	177,169	181,639	97.5
United Kingdom:					
England and Wales	June 1938	d)	722,355	856,713	84.3
Scotland	June 1939	d)	127,788	141,561	90.3
Northern Ireland	June 1939	d)	92,022	98,514	93.4
Czechoslovakia	May 1930	c)	687,713	748,772	91.8
Canada	June 1931	c)	3,113,909	3,215,431	96.8
Argentina	June 1937	e)	7,853,483	8,319,143	94.4

(a) Horses employed in agriculture. — (b) Horses in rural communes. — (c) Farm horses. — (d) Unbroken horses, stallions for breeding and horses employed in agriculture. — (e) Not including horses in urban centers

Finally, it must be mentioned that the statistics of some countries do not include army horses, or only give their total number, without any detail. This is the case in Germany, France, Italy, Poland and Romania. In 1929 in France and in 1930 in Italy, the number of army horses represented respectively 4,5 and 3,7 per cent. of the total.

III. — The classifications adopted by a certain number of countries allow grouping separately young and adult animals. The age limit which sets the line of demarcation between the two groups, agrees in many cases with that recommended by the International Institute of Agriculture which makes a net distinction between animals up to three years and those three years old and over. There are however many exceptions. In Luxembourg and in Switzerland the limit

II. — *Distribution of horses according to age.*

COUNTRY	Date	Horses up to 3 years	Horses 3 years old and over	Total	% in proportion to total: Horses up to 3 years	% in proportion to total: Horses 3 years old and over
Germany (1)	Dec. 1938	687,500	2,755,200	3,442,700	20.0	80.0
Austria	June 1930	2) 21,379	3) 226,348	247,727 2)	28.6 3)	91.4
Belgium (a)	Dec. 1939	79,718	165,831	245,549	32.5	67.5
Bulgaria	Dec. 1934	102,215	429,304	531,519	19.2	80.8
Denmark (b)	July 1939	145,036	432,223	577,259	25.1	74.9
Spain	July 1939	132,841	422,574	555,415	23.9	76.1
Estonia	June 1929	26,539	178,909	205,448	12,9	87.1
Finland	Sept. 1938	69,832	320,530	390,362	17.9	82.1
France (c)	Nov. 1929	564,296	2,323,142	2,887,438	19.5	80.5
Hungary	Febr.-march 1938	152,924	660,667	813,591	18.8	81.2
Ireland d)	June 1939	4) 87,729	5) 357,419	445,148 4)	19.7 5)	80.3
Italy (1)	March 1930	6) 110,789	7) 831,686	942,475 6)	11.8 7)	88.2
Latvia	June 1929	71,200	343,500	414,700	17.2	82.8
Lithuania	Dec. 1939	115,800	410,180	525,980	22.0	78.0
Luxembourg	Oct. 1939	8) 4,402	9) 13,615	18,017 8)	24.4 9)	75.6
Norway (b)	June 1939	48,011	155,920	203,931	23.5	76.5
Netherlands	May 1939	81,813	240,339	322,152	25.4	74.6
Poland (1)	Nov. 1927	677,399	3,449,537	4,126,936	16.4	83.6
Portugal	Dec. 1934	19,152	71,178	90,330	21.2	78.8
Romania (1)	1938	355,728	1,802,538	2,158,266	16.5	83.5
United Kingdom:						
England and Wales d)	June 1938	4) 156,202	5) 700,511	856,713 4)	18.2 5)	81.8
Scotland d)	June 1939	4) 27,476	5) 114,085	141,561 4)	19.4 5)	80.6
Northern Ireland d)	June 1938	4) 12,010	5) 86,504	98,514 4)	12.2 5)	87.8
Sweden	Sept. 1932	80,471	531,286	611,757	13.2	86.8
Switzerland	April 1936	8) 17,142	9) 122,647	139,789 8)	12.3 9)	87.7
Czechoslovakia	Jan. 1937	123,294	580,541	703,835	17.5	82.5
Yugoslavia (c)	Dec. 1939	211.764	1,061,595	1,273,359	16.6	83.4
U. S. S. R. (10)	Jan. 1935	2,175,400	12,760,900	14,936,300	14.6	85.4
Canada (c)	June 1939	11) 401,100	12) 2,423,240	2,824,340 11)	14.2 12)	85.8
United States c)	Jan. 1940	11) 1,291,000	12) 9,325,000	10,616,000 11)	12.2 12)	87.8
Guatemala (13)	April 1930	8,869	54,118	62,987	14.1	85.9
Argentina (14)	June 1937	2) 1,446,362	3) 6,407,121	7,853,483 2)	18.4 3)	81.6
Chile	June 1930	86,633	354,394	441,027	19.6	80.4
Burma	1938-39	11) 6,281	12) 42,847	49,129 11)	12.8 12)	87.2
India: British Provinces	1937-38	11) 219,500	12) 1,411,268	1,630,768 11)	13.5 12)	86.5
» : Native states	1936-37	11) 163,648	12) 589,465	753,113 11)	21.7 12)	78.3
Japan	Dec. 1936	280,510	1,151,410	1,431,920	19.6	80.4
Union of S. Africa (e)	August 1937	99,928	304.611	404,539	24.7	75.3

(a) Horses employed in agriculture. — (b) Horses in rural communes. — (c) Farm horses — (d) Unbroken horses, stallions for breeding and horses employed in agriculture. — e) Horses belonging to Europeans.

(1) Not including army horses. — (2) Colts, fillies and young horses 1 year old and over. — (3) Horses other than colts, fillies and young horses 1 year old and over. — (4) Unbroken horses. — (5) Horses, other than unbroken ones. — (6) Horses born in 1928, 1929 and 1930. — (7) Horses, born before 1928. — (8) Horses up to 4 years old. — (9) Horses 4 years old and over. — (10) Not including 1000 horses in transit unclassified — (11) Horses up to 2 years old. — (12) Horses 2 years old and over. — (13) Not including 130 thourogh-breds, unclassified. — (14) Not including 465,660 horses in urban centers, unclassified.

has been raised to 4 years; in Canada, United States, Burma, India and Argentina (only for mares), on the contrary, it has been lowered to two years, while in Italy it is 2 ¼ years. In the United Kingdom and Ireland a distinction is made between unbroken and other horses. No age limit between young horses over 1 year old and adult animals has been set in Austria and Argentina (except for mares).

It is evident that the displacement of the age limit has quite a considerable influence on the relative importance of the number of horses belonging to the category of either young or adult animals. In Germany, for instance, for the year 1938, the proportion between young animals and the total number of horses goes from 13,6 per cent. to 20,0 and 26,6 per cent, according to whether the age limit of respectively 2, 3, and 4 years is adopted. In Poland the same proportion goes from 16,4 per cent. with the age limit of 3 years, to 24,5 per cent. with the age limit of 4 years.

IV. — The minimum classification recommended by the Institute, suggests the subdivision into two categories of the horses up to 3 years old: viz., colts and fillies under 1 year of age; young stock of 1 and less than 3 years of age. Table III

III. — *Distribution of horses, up to 3 years, according to age.*

COUNTRY	Date	Colts and fillies under 1 year	Young horses 1 year old and over, up to 3 years	Total	% in proportion to total: Colts and fillies under 1 year	% in proportion to total: Young horses 1 year old and over, up to 3 years
Germany (1)	Dec. 1938	230,300	449,200	687,500	34.7	65.3
Austria	June 1930	7,776	2) 13,603	3) 21,379	36.4	2) 63.6
Bulgaria	Dec. 1934	39,575	62,640	102,215	38.7	61.3
Denmark (a)	July 1939	53,504	91,532	145,036	36.9	63.1
Spain	July 1939	50,124	82,717	132,841	37.7	62.3
Estonia	June 1929	7,908	18,631	26,539	29.8	70.2
Finland	Sept. 1938	28,609	41 223	69,832	41.0	59.0
Ireland	June 1939	38,063	4) 49,666	5) 87,729	43.4	4) 56.6
Latvia	June 1939	29,300	41,900	71,200	41.2	58.8
Lithuania	Dec. 1939	43,850	71,950	115,800	37,9	62,1
Luxembourg	Oct. 1939	865	6) 3,537	7) 4,402	19.7	6) 80.3
Poland (1)	Nov. 1927	211,652	6) 800,789	6) 1,012,441	20.9	6) 79.1
United Kindom:						
England and Wales	June 1938	52,883	4) 103,319	5) 156,202	33.9	4) 66.1
Scotland	June 1939	7,083	4) 20,393	5) 27,476	25.8	4) 74.2
N. Ireland	June 1938	4,754	4) 7,256	5) 12,010	39.6	4) 60.4
Sweden	Sept. 1932	31,676	48,795	80,471	39.4	60.6
Czechoslovakia	Jan. 1937	37,999	85,295	123,294	30.8	69.2
U. S. S. R. (8)	Jan. 1935	966,900	1,208,500	2,175,400	44.4	55.6
Argentina (9)	June 1937	584,330	2) 862,032	3) 1,446,362	40.4	2) 59.6
Chile	June 1930	27,582	59,051	86,633	31.8	68.2
Union of S. Africa (b)	August 1937	43,933	55,995	99,928	44.0	56.0

(a) Horses in rural communes. — (b) Horses belonging to Europeans.

(1) Not including army horses. — (2) Young horses over 1 year. — (3) Colts, fillies and young horses over 1 year. — (4) Unbroken horses, 1 year old and over. — (5) Unbroken horses — (6) Horses 1 year old and over, up to 4 years. — (7) Horses, up to 4 years. — (8) Not including horses in transit. — (9) Not including horses in urban centers.

furnishes this detail for all the countries where it may be obtained, including those where the age limit for young horses does not coincide with the 3 years limit suggested in the standard form of the World Agricultural Census.

V. — As regards the distribution of adult horses into three categories (entire horses, mares, geldings) available details are contained in table IV.

IV. — *Distribution of horses 3 years old and over.*

COUNTRY	Date	Mares	Entire horses	Geldings	Total	% in proportion to total: Mares	% in proportion to total: Entire horses	% in proportion to total: Geldings
Austria (1)	June 1930	88,119	19,277	118,952	226,348	38.9	8.5	52.6
Belgium (*a*)	Dec. 1939	113,472	2,727	49,632	165,831	68.4	1.7	29.9
Bulgaria	Dec. 1934	193,843	17,586	217,875	429,304	45.2	4.1	50.7
Denmark (*b*)	July 1939	224,948	4,114	203,161	432,223	52.0	1.0	47.0
Spain	July 1939	242,278	← 180,296 →		422,574	57.3	← 42.7 →	
Finland	Sept. 1938	165,327	7,432	147,771	320,530	51.6	2.3	46.1
France (*c*)	Nov. 1929	1,191,255	195,100	936,787	2,323,142	51.3	8.4	40.3
Hungary	Feb.-March 1938	389,328	7,831	263,508	660,667	58.9	1.2	39.9
Italy (2) (3)	March 1930	424,290	← 407,396 →		831,686	51.0	← 49.0 →	
Poland (2) (4)	Nov. 1927	1,610,066	190,885	1,313,544	3,114,495	51.7	6.1	42.2
Romania (3)	1938	913,198	84,623	804,717	1,802,538	50.7	4.7	44.6
Czechoslovakia	Jan. 1937	286,121	8,617	285,803	580,541	49.3	1.5	49.2
Yugoslavia (*c*)	Dec. 1939	520,180	16,780	524,635	1,061,595	49.0	1.6	49.4
U. S. S. R.	Jan. 1935	6,045,800	1,288,200	5,426,900	12,760,900	47.4	10.1	42.5
Canada (*c*) (6)	June 1939	1 275,300	24,740	1,123,200	2,423,240	52.6	1.0	46.4
Argentina (1) (6)	June 1937	2,630,643	125,810	3,650,668	6,407,121	41.0	2.0	57.0
Chile	June 1930	159,395	7,899	187,100	354 394	45.0	2.2	52.8
Burma (5)	1938-39	21,898	2,176	18,773	42,847	51.1	5.1	43.8
India: British Prov (5)	1937-38	666,506	← 744,762 →		1 411 268	47.2	← 52.8 →	
» : Native States (5)	1936-37	334,552	← 254,913 →		589,465	56.8	← 43.2 →	
Japan	Dec. 1936	666,980	← 484,430 →		1,151,410	57.9	← 42.1 →	
Union of S. Africa (*d*)	August 1937	124,157	17,444	163,010	304,611	40.8	5.7	53.5

(*a*) Horses employed in agriculture. — (*b*) Horses in rural communes. — (*c*) Farm horses. — (*d*) Horses belonging to Europeans.

(1) Horses, other than colts, fillies and young horses over 1 year. — (2) Not including army horses. — (3) Horses born before 1928. — (4) Horses 4 years old and over. — (5) Horses 2 years old and over. — (6) Not including horses in urban centers.

VI. — The preceding tables show that, at the present stage of the statistics, the minimum classification form contained in the Programe of the 1940 Agricultural Census is only applicable in a comparatively limited number of countries, and quite often only in an uncomplete and imperfect manner. The field for the adoption of the complementary suggestions made, in a subordinate way, by the Conferences of Agricultural Statisticians is naturally even more limited.

The distinction between males and females for young horses, figures, separately for each one of the two categories suggested in the minimum classification

form, or for the two categories together, only in the few countries included in the following table:

V. — *Distribution of horses, up to 3 years of age, according to sex.*

Country	Date	Colt and fillies under 1 year		Horses 1 year old and over, up to 3 years		Total horses up to 3 years	
		Males	Females	Males	Females	Males	Females
Belgium (a)	Dec. 1939	—	—	—	—	36,370	43,348
Bulgaria	Dec 1934	21,458	18,117	31,846	30,794	53,304	48,911
Spain	July 1939	—	—	40,262	42,455	—	—
Hungary	Feb.-March 1938	—	—	—	—	77,893	75,031
Portugal	Dec. 1934	—	—	—	—	9,339	9,813
Czechoslovakia	Jan. 1937	17,170	20,829	44,358	40,937	61,528	61,766
Argentina (b)	June 1937	308,226	276,104	417,492	444,540	725,718	720,644
Chile	June 1930	16,264	11,318	34 178	24,873	50,442	36,191

(a) Horses in rural communes. — (b) Not including horses in urban centers.

The subdivision of entire horses into two groups, those for breeding and those not for breeding, is done only in a small number of countries: available figures are contained in Table VI, in which are shown also the data relative to the number of stallions for service furnished by the statistics of some countries that do not give the totals of entire horses. Bulgaria and France make a distinction between entire horses used exclusively for service and those that are employed both for service and work.

VI. — *Distribution of entire horses three years old and over.*

Country	Date		Stallions for breeding	Other entire horses	Total entire horses
Austria	June	1930	1,576	17,701	19,277
Bulgaria	Dec.	1934	(a) 1,485 (b) 4,562	11,539	17,586
Spain	July	1939	2,988	—	—
France (1) (2)	Nov.	1929	(a) 5,835 (b) 11,674	177,591	195,100
Hungary	Feb.-March	1938	3,658	4,173	7,831
Italy (2) (3)	March	1930	6,789	—	—
England and Wales	June	1938	3,952	—	—
Scotland	June	1939	623	—	—
Switzerland (4)	April	1936	201	—	—
Czechoslovakia	January	1937	1,674	6,943	8,617

(a) Stallions exlusively for breeding. — (b) Entire horses for breeding and work.
(1) Farm horses. — (2) Not including army horses. — (3) Horses born before 1928. — (4) Entire horses 4 years old and over.

Lastly, horses three years of age and over are distributed into age groups only in some countries. Sometimes the subdivision is applied for each one of the three categories recommended by the standard classification form (mares,

entire horses, geldings), sometimes for the data of the three categories together. The number and composition of age groups are not uniform, as it is shown in Table VII which contains available details.

VII. — *Distribution according to age of horses three years old and over.*

COUNTRY AND DATE	Age	Mares	Stallions	Entire horses	Total	% in proportion to total
Germany (*a*)	From 3 to 4 years	—	—	—	195,100	7.1
(December 1938)	From 4 to 5 years	—	—	—	191,100	6.9
	From 5 to 9 years	—	—	—	563,400	20.4
	From 9 to 14 years	—	—	—	878,200	31.9
	14 years and over	—	—	—	927,400	33.7
	Total . . .	—	—	—	2,755,200	100.0
Denmark (*b*)	From 3 to 6 years	40,409	—	36,678 (1)	77,087 (1)	17.8
(July 1933)	From 6 to 11 years	100,934	—	99,826 (1)	200,760 (1)	46.4
	11 years and over	84,790	—	70,442 (1)	155,232 (1)	35.8
	Total . . .	226,133	3,274	206,946 (1)	433,079 (1)	100.0
Estonia	From 3 to 15 years	62,504	10,918	78,748	152,170	85.1
(June 1929)	15 years and over	—	—	—	26,739	14.9
	Total . . .	—	—	—	178,909	100.0
Latvia	From 3 to 15 years	—	—	—	234,800	68.4
(June 1939)	15 years and over	—	—	—	108,700	31.6
	Total . . .	—	—	—	343,500	100.0
Sweden	From 3 to 15 years	—	—	—	(1) 398,648 (1)	74.1
(September 1932)	15 years and over	—	—	—	(1) 139,248 (1)	25.9
	Total . . .	—	—	—	(1) 537,896 (1)	100.0
Czechoslovakia	From 3 to 15 years	258 412	7,100	250,699	516,211	88.9
(January 1937)	15 years and over	27,709	1,517	35,104	64,330	11.1
	Total . . .	286,121	8,617	285,803	580,541	100.0
U. S. S. R.	From 3 to 8 years	2,699,500	887,800	1,824,400	5,411,700	42.4
(January 1935)	From 8 to 12 years	2,146,200	299,400	1,998,800	4,444,400	34.8
	12 years and over	1,200,100	101,000	1,603,700	2,904,800	22.8
	Total . . .	6,045,800	1,288,200	5,426,900	12,760,900	100.0

(*a*) Not including army horses. — (*b*) Horses in rural communes.
(1) Not including entire horses.

VII. — The detailed information contained in this study, which is based on the statistics that are available at present, clearly shows the necessity that further efforts be accomplished in order to make the statistics of horses in the different countries more precise and homogeneous. Not only many countries still limit themselves to merely furnish totals for horses, without any detail, or to give some very broad subdivions, but even when details are more numerous, they are often insufficient and do not satisfactorily correspond to the minimum classification program, recommended by the Conferences of agricultural statisticians for the setting up of satisfactory international horses statistics, based on uniform data.

PRODUCTION — LATEST INFORMATION

Finland: According to the most recent informations the areas and yields of the most important crops in 1942, compared with those of 1941 are as follows:

Areas.

(thousand acres)

Crops	1942	1941	% 1942 1941 = 100
Wheat	314	331	94.9
Rye	395	467	84.7
Barley	267	326	81.8
Oats	937	1,055	88.8
Meslin	12	21	57.8
Sugar beets	6	8	74.6
Flax and hemp	9	8	118.7
Potatoes	167	193	86.4
Permanent meadows	571	865	66.0
Artificially sown grasses	3,121	2,498	124.9

Yield.

(thousand centals)

Wheat	3,724	3,426	108.7
Rye	4,475	5,137	87.1
Barley	3,175	2,910	109,1
Oats	12,214	10,626	114.9
Meslin	132	205	64.5
Potatoes	21,385	17,483	122.3
Permanent meadows (hay)	4,828	3,924	123.0
Artificially sown grasses (hay)	53,021	44,049	120.4

(thousand bushels)

Wheat	6,206	5,710	108.7
Rye	7,992	9,173	87.1
Barley	6,614	6,063	109.1
Oats	38,167	33,207	114.9
Meslin	228	354	64.5
Potatoes	35,641	29,137	122.3
Permanent meadows (hay)	241	196	123.0
Artificially sown grasses (hay)	2,651	2,202	120.4

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS

The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country: Germany, Bohemia and Moravia (Protectorate); Hungary: 1 = excellent, 2 = good, 3 = average, 4 = poor, 5 = very poor; Finland: 8 = very good, 6 = above the average, 5 = average; France: 100 = excellent, 70 = good, 60 = fairly good, 50 = average, 30 = poor; Romania and Sweden: 5 = excellent, 4 = good, 3 = average, 2 = poor, 1 = very poor; Netherlands: 90 = excellent, 70 = good, 60 = fairly good, 50 = below awerage; Portugal: 100 = excellent, 80 = good, 60 = average, 40 = poor, 20 = very poor; Switzerland: 100 = excellent, 90 = very good, 75 = good, 60 = fairly good, 50 = average, 40 = rather poor, 30 = poor, 10 = very poor: U.S.S.R.: 5 = good, 4 = above the average, 3 = average, 2 = below average, 1 = poor; Canada: 100 = crop condition promising a yield equivalent to the average yield of a long series of years; United States: 100 = crop condition which promises a normal yield; Egypt: 100 = crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed: 100 = crop condition which promises a yield equal to the average of the last ten years.

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

VEGETAL PRODUCTION

OLEAGINEOUS CULTURES IN EUROPE AND ATTEMPTS AT THEIR DEVELOPMENT (*continuation*)

by IVAN GRINENCO

In the first part of this article which appeared in the September issue of this Bulletin, we broadly indicated the situation of the supply of vegetal oils in Europe (not including the U. S. S. R.) up to the breaking of the present world war.

We are now giving a summary of the information which we have been able to gather on the efforts made by many European countries (outside those of the South-Eastern section of this continent) after the breaking of the war and the situation created by it, in order to develop the cultures of oleagineous plants and thus also increase the quantities of vegetal oils obtained from their own production. Similar information for the South-Eastern European countries — which are the most important in the production of oleagineous seeds — will appear in the December issue of this Bulletin, together with some general conclusions.

II.

Government measures to increase the production of oleagineous crops in various countries.

The differences in the climatic conditions and in the economic structure of the European countries, naturally influence in various ways the adoption of Government measures in the different countries for an increase of the production

of oleagineous crops. All these measures, however, aim at insuring the maximum exploitation of all the means and resources of each country to secure the highest possible amounts of vegetal oils. In some countries, efforts are directed to the increase of existing oleagineous crops, in some others at resuming the cultivation of oleagineous plants which had long been completely abandoned, or at the introduction of some new culture. The supplementary acreage needed to increase production is obtained at the expenses of some other less indispensable crop, or else, and oftener, at the expense of natural meadows and especially fallow land.

Notwistanding the different conditions prevailing even in comparatively near regions, the European countries can be so grouped as to synthetically outline what has been done in this continent to overcome the difficulties created by the war on the way of getting the necessary supply of vegetal oils

Scandinavian countries.

Before the war, the group of the Scandinavian countries (Finland, Norway and Sweden, to which Denmark may also be added), did not cultivate any oleagineous plants in such quantity as to bo worth mentioning and consequently they relied entirely on imports of seeds and vegetal oils. This almost absolute absence of oleagineous cultures was partly due to local climate condtions which are utterly unfavourable to these crops, but even more, to the fact that they were less profitable than other crops.

Information sent to the Institute by the Norwegian Government, indicates that so far there are no cultures of oleagineous plants in *Norway*, in spite of some attempts at introducing them which proved unsatisfactory.

In *Sweden*, as far back as 1939, Parliament had granted a fund of 89.000 crowns to get some supplies of oleagineous plant seedings in view of an extension of oil crops. Indeed, beginning with 1940, contracts signed by the farmers caused a considerable increase of acreage and production of oleagineous crops, as as may be seen from the statistics furnished by the Swedish Governement, which appear in the following table:

Crop	Area (acres)			Production (metric tons)		
	1940	1941	1942	1940	1941	1942
White mustard	...	12,710	34,250	...	5,890	...
Colza	70	2,530	5,190	29	1,570	...
Linseed	510	3,410	4,280	200	1,020	...
Poppyseed	270	2,370	1,790	75	489	...
Sunflower	...	20	100	...	10	...
Soya	40	120	90	12	26	...

No official data on production are yet available for the year 1942, when the total area to oleagineous crops was already over 44,500 acres but, according to private information, the total production of all the oleagineous crops was estimated at about 21,000 metric tons against 9,000 metric tons in 1941. Colza gave the best results: its yield rose from about 980 lbs per acre in 1940 to 1,340 lbs per acre in 1941.

In 1941, white mustard, to which the largest acreage was devoted, yielded a little over 1,000 lbs per acre. In the same year, poppyseed yielded 616 lbs per acre. Linseed yields decreased from 865 lbs per acre in 1940 to 660 lbs per acre the following year. As regards soya and sunflower, which at present are grown over a small area, the former gave absolutely negative results, while the latter registered quite satisfactory yields.

The period of time to which these statistics are referring, is too short to justify a final judgment over the possibilities of an increase of the different cultures. But the results obtained so far are rather encouraging, especially if present emergency conditions are taken into account.

According to private information, Sweden, on an area of about 148,000 acres, of which 62,000 destined to Winter colza, 49,000 to Spring colza and 37,000 to poppyseed could obtain a sufficient quantity of vegetal oils to furnish the margarine needed to fill the country's requirements for alimentary fats. The acreage destined to oleagineous crops would be slightly larger than that now occupied by sugar beets which in 1941 amounted to 131,000 acres.

In 1940, the price of colza and soya was 60 crowns per quintal and that of linseed and poppyseed 70 crowns. In 1941 prices went considerably up: 108,5 crowns for white mustard and colza, 139,5 for linseed, poppyseed and sunflower and 170,5 crowns for soya.

In 1942 prices fell sharply: they were, 85,0 crowns for white mustard, 100 for colza and linseed, 125 for poppyseed and sunflower, and 150 for soya.

It is worth remarking that in 1942, the price of Winter wheat was fixed at 27 crowns per quintal, and that of the Spring variety at 29 crowns. Even if the fact is taken into account that premiums of respectively 60 and 40 crowns per quintal were granted for the two varieties of wheat, it still appears that the price level of wheat was considerably lower than that of oleagineous seeds.

Before the present war, *Denmark* imported most of the oleagineous seeds and fruit (chiefly coprah and soya) for the production of vegetal oils consumed in the country. With the exception of some small areas sown on flax for fibre, oleagineous cultures were represented only by white mustard which covered about 5,000 acres, and whose seeds were used chiefly as livestock feed or to prepare mustard.

Since 1939, as soon as the war broke out, but especially in 1940 and following years, when, owing to the advance of the German army, the country was completely cut out of its imports from abroad, Denmark felt the necessity of urgently organizing the cultures of oleagineous plants. The results of the efforts

in this direction are shown in the following table, which contains the data sent the Institute by the Danish Government:

Crop	Area (acres)			Production (metric tons)		
	1940	1941	1942	1940	1941	1942
White mustard	14,860	19,710	40-42,000	5,000	5,600	16,000
Flax for fibre (seed)	5,440	14,580	16,560	...	3,000	...
Flax for seeds	6,670	8,400	8,160	...	2,000	...
Hemp	...	1,290	...	...	...	...

Yelds by the acre in 1941 were about 625 lbs for white mustard, 535 lbs for flax cultivated for seeds and 446 lbs for flax cultivated for fibre.

The total area of oleagineous cultures increased from about 27,200 acres in 1940 to about 44,500 acres in 1941 and to about 66,700 in 1942. The production of white mustard in 1942 is officially estimated to correspond to 4,000 metric tons of oil. If to this figure is added the production of linseed oil, which judging from the acreage to linseed in 1942 should not be much different from 1941, the total 1942 production should vary between 5,700 and 5,800 metric tons.

Before the war, the needs for vegetal metric oils in Denmark covered by imports from abroad, amounted to about 90,000 metric tons, of which 70,000 were used as foodstuff and 20,000 for industrial purposes.

The measures taken to increase the country's cultures of oleagineous plants consist chiefly in the fixing of the prices to be paid to the producers for oleagineous seeds.

The Agricultural Consultative Council, which in 1940 had created a Commission charged with the study of the possibilities of increasing the country's oleagineous cultures, at the beginning of the year 1941 had prepared a standard contract form for the sales by farmers to oil extracting factories.

In October 1941, the Ministry of Commerce decreed that flax seed (both from flax for seed and flax for fibre) of the 1941 and preceding harvests should be delivered to some agencies authorised to buy it at the prices fixed by the Government.

The price for linseed was fixed at 92 crowns per quintal which is 3 ½ times higher than that for barley delivered at storehouses. The price of mustard seeds was fixed at 120 crowns per quintal.

For the year 1942 the Agricultural Consultative Council proposed to increase prices to a level corresponding to 4 ½ times the price of barley, for linseed seeds and to 5 ½ times for mustard. The proposal was approved by the Ministry. The prices of the seeds of flax grown for fibre were to be fixed later, when the results of the flax harvest should be known.

While the prices fixed for linseed were accepted by the oil producers, it was not so for the prices of mustard, because the factory owners, before agreeying to them, wanted to be assured that the oil would be sold at remunerative prices. Thanks to the good offices of the Ministry of Commerce, at the end of September

the conversations between the oil producers and the representatives of the different industries furnished by them, in the attempt to find a solution to the question of oil prices, were continuying.

The *Finnish Government* has notified the Institute that in *Finland* linseed and poppyseed were cultivated only in 1942 and on a small scale: Linseed for seed over 1,000 acres and poppyseed on 60 acres. Linseed yields were estimated at 700 lbs per acre.

A plan for a considerable increase of these cultures in 1943 is now under consideration. So far no legislative measure concerning oleagineous cultures has been taken in Finland.

Baltic countries and General Gouvernment.

In the group of the Baltic countries (Estonia, Latvia and Lituania) and in the General Government, the oleagineous cultures proper (outside of flax and hemp) are represented especially by colza, which is cultivated almost exclusively on Polish territories.

Available information from these countries comes from unofficial sources and is rare and fragmentary.

In *Estonia*, it was the intention of the authorities to devote to the culture of flax in the year 1942 an area of 74,000 acres, against 57,000 acres in 1941. But it seems that there will be no further increase of this culture, because it is the intention of the authorities to increase the acreage to bread-making cereals and potatoes. In the last years before the war, the area sown on flax in Estonia had reached 76,600 acres in 1937, but had fallen to 56,800 acres in the course of the two following years. The estimate for the 1942 production of linseed put it at 10,000 metric tons, viz., to almost the same amount as in 1937.

In *Latvia*, the area sown on flax in 1942 should have amounted to 188,000 acres. This figure is considerably higher than that of the year 1941 (138,000 acres), and also of the preceding years, including the maximum registered in 1937 with 170,500 acres.

As regards *Lithuania*, the most recent available figures on the culture of flax go back to the year 1940 when the area to this crop amounted to 232,000 acres, and production of seeds to 32,900 metric tons. Although these figures cannot be compared with those of the years before on account of the territorial changes that took place between 1939 and 1940, yet they are a clear indication that there has been a considerable increase in the culture of flax.

In the *General Government*, the area sown to colza seems to have increased, from 1939 to the present date, by about 40 per cent. It seems also that, for the year 1942 the area to be sown to winter colza (especially in the large holdings)

should have amounted to 86,000 acres. Each large holding was expected to sow to winter colza an area of at least 3,7 acres. For information sake, it may be added that in 1938, the area sown to Winter and Spring colza over the whole territory of former Poland amounted to 163,000 acres, of which 101,000 on the holdings over 50 hectares (124 acres) and the rest (62,000 acres) on the holdings below that acreage. Yields by the acre were generally higher in the group of large holdings. In 1938, for instance, yields were 1,070 lbs per acre in holdings of the first group and 800 lbs par acre in those of the second. Winter colza predominated. Besides this crop, especially in the Southern parts of the territories of former Poland, the cultivation of poppyseed had attained some importance. Attempts had also been made to introduce and increase the culture of soya.

Countries of Central Europe.

Information on this group of countries (Germany, Protectorate of Bohemia and Moravia, Slovakia and Switzerland) is rather scarce vague and mostly drawn from private sources.

In *Germany* the area destined to the most important oleagineus crops (colza, rape-seed, flax, and hemp, which in 1878 amounted to 843,000 acres, after a continuous regression interrupted only for a short time after the first world war, had reached in 1933 the lowest level (about 25,000 acres). The seriousness of the problem of the national production of vegetal oils in that country had been felt therefore much sooner than elsewhere, and had necessitated the strongest possible effort to improve the situation. It is on this account that already in 1938, only a few years after the maximum decrease, a considerable recovery was noticeable in the cultures of oleagineous plants, whose total acreages (within the frontiers of 1937) amounted to 306,000 acres distributed as follows:

	Area (acres)	Production (metric tons)
Colza	127,490	112,000
Rape-seed	25,510	16,300
Poppy-seed	9,340	...
Mustard	1,610	...
Flax	110,870	22,800
Hemp	31.330	7,900

In Germany, yields per acre are rather high. In 1938 they were: colza 1,960 lbs, rape-seed 1,430 lbs, hemp-seed 550 lbs, linseed 450 lbs. As regards poppy-seed, 1,340 lbs per acre is considered a good average yield.

Statistics for the years following 1938, are less complete. In 1939, in Germany, including Austria and the territories of the Sudeten and Memel, colza covered 96,200 acres, rape-seed 16,600, linseed 143,800 and hemp 39,200, which makes a total of about 296,000 acres against 306,000 in 1938. In 1940, accord-

ing to unofficial information, the acreage sown to oleagineous crops seems to have trebled, and in 1942 it was foreseen that colza and rape-seed alone would cover 741,000 acres.

Besides these few figures, some information is available which indicates that Germany is attempting also to increase the culture of some other oil-giving plants, such, for instance, as safflower, camline, sunflower and soya, and to utilise the seeds of raisins and the grains of tobacco which could yield 1,500 metric tons and 1,000 metric tons respectively of oil a year. She is also trying to exploit other resources of the country, which, heretofore, were not made use of at all (kernels and seeds of certain fruits).

In order to further encourage the intensification of oleagineous cultures the German Government has fixed the prices per quintal to be paid to the producers for seeds. The price of colza, which was 32 RM ,was raised to 40 RM in 1940, 44 RM in 1941, and 50 RM in 1942. These increases of the years 1941, and 1942 were applicable only to the production of cultures made on the basis of contracts previously stipulated between the farmers and factories for the extraction of oil. For the other deliveries, the price of 40 RM has remained unchanged. In 1942 the price of colza was about double that of wheat. The price of poppy-seed was 80 RM in 1940 and 1941. In 1942 these prices were raised to 90 RM, payable only for products of cultures made on a contract basis. Prices of linseed remained unchanged at 38 RM in 1940, 1941 and 1942; but a premium of 10 RM is allowed to farmers who deliver not scutched flax The prices of the other oil-giving seeds did not change in 1942: they were, 30 RM for sunflower, camline and safflower seeds, and 50 RM for beech-nuts.

According to press information, the area sown to colza in 1941 in the *Protectorate of Bohemia and Moravia* was seven times larger than in 1940 and three times the average of the years 1934 to 1939. The area to flax in 1941 seems also to have been three times the average for the period mentioned above. The production of colza and flax in 1941, compared with the average of the years 1934 to 1939, increased four and three times respectively. The difference between the increase of area and production of colza is to be attributed to the fact that the winter 1941 was very unfavourable to this crop. For the year 1942, the Government took some measures whereby all holdings 14 hectares (36 acres) and over in the communes expressly indicated, were to devote 3,5 per cent. of their arable land to the culture of colza. In each one of these Communes a committee was to be created, having as its task the preparation of the list of farmers and the control of the deliveries of colza to storage-houses. Farmers were guaranteed that they would receive the necessary seeds and fertilizers, and would also be granted a quantity of oil cakes and eatable fats in proportion to the amounts of colza seeds delivered by them to storage-houses at the prices previously agreed upon. It was also decided that, in some specified Communes, a certain percentage of arable land should be destined to the culture of flax. The minimum area to be devoted to this crop was fixed at 0.05 hectares (0,1 acres). It was finally decreed that one poppy-seed plant should be planted for each square metre sown to sugar beets, forage beets, eatable carrots and chicory.

The following table contains available statistics for *Slovakia*:

Crop	Area (acres)				Production (metric tons)			
	1939	1940	1941	1942	1939	1940	1941	1942
Colza	1,540	710	1,530	1,170	830	270	830	630
Flax (seed)	...	...	250	130	...	...	55	30
Sunflower (simple culture)	90	30	170	120	35	9	49	15
Sunflower (associated culture)	2,000	1,030	...	...	127	63	...	...
Soya	200	220	50	20	97	90	32	14
Poppy-seed	6,150	6,840	6,870	6,920	2,050	1,970	1,945	...
White mustard	30	50	...	290	12	15	...	...
Safflower	—	—	10	10	—	—	2	2
Flax (fibre and seed)	6,800	6,790	3,700	...	1,200	1,080	...	...
Hemp (seed)	9,950	9,210	9,360	...	2,210	1,830	...	...

Most of the data on acreage refer to harvested areas which differed only little from those harvested. For comparison' sake, it may be remarked that in 1938, which was the last year when conditions were normal, colza sown on an area of 3,640 acres, had yielded 2,125 metric tons, and poppy-seed on an area of 5,750 acres, 1,920 metric tons. During the years 1939 to 1941, no important changes were registered in the total area sown to oleagineous plants. This area amounted to about 24,700 acres, viz. nearly 1 per cent. of the country's total.

Information from private sources indicate that Slovakia, in order to fill its needs for vegetal oils should be able to produce 18,500 metric tons of oil, and that, on the basis of present unit yields, she could obtain this quantity by sowing to oleagineous crops about 116,000 acres. The Government is fully aware of the necessity of further increasing these crops. From information sent by the Slovak Government to the Institute, we gather that the Ministry of National Economy has planned to provisionally devote to colza and to poppy-seed an area of 11,100 acres, while 3,460 acres are to be sown to sunflower, 2,470 to white mustard, 1,980 to linseed, 1,240 to soya and 990 to safflower. This makes a total of about 32,000 acres to be sown to these crops against 8,650 acres sown in 1942. Areas sown to hemp and flax for fibre and seed are not included in this total.

For the year 1942-43, the culture of colza was made obligatory in all holdings of over 70 hectares (170 acres): at least 2 per cent of their total arable land was to be sown to this crop. As a result of this decree, the acreage to colza could be increased to about 9,900 acres.

It may be said that before the war, no oleagineous plants were grown in *Switzerland*. It is estimated that about 27,000 acres of which ⅔ to colza and ⅓ to sunflower should be devoted to them in order to fill the needs of the country for eatable oils. Since the beginning of the war, great efforts have been made to introduce and develop the culture of these plants. The first results obtained were: from 1940 to 1941 the area to colza increased from 94 to 381 acres; that of poppy-seed from 353 to 1,337. In 1942 the area sown to these two crops was 3,000 acres. The increase of acreage to poppy-seed in 1941 was much larger

than for colza, because the culture of oleagineous plants was made obligatory only in the Spring of 1941. Colza is chiefly a winter crop, and had already been sown in the Autumn of the year before. It must also be considered that colza requires much more care than poppy-seed. Prices fixed in 1941 were 190 frs. for poppy-seed and 130 frs. for colza.

Flax and hemp are considered essentially textile crops. The acreage sown to them in 1941 amounted to 151 and 40 acres respectively, against 30 and 5 acres respectively in 1940.

Recently the Government has taken some measures to utilize the seeds of raisins for the production of oil.

Countries of North-Western Europe.

In *Belgium*, before the breaking of the present war, in 1939 oleagineous cultures were represented almost exclusively by flax, which in that year covered an area of about 111,000 acres, with a production of seeds of about 25,000 tons metric. In the same year, the country's two other oleagineous crops, viz. hemp and colza, were grown on only 84 and 42 acres respectively. Since to beginning of the war, Belgium had begun to study the problem of how to increase the culture of colza, which as far back as 1866 covered 64,000 acres. Later, in 1880, this area had decreased to about 15,800 acres, and by 1913 it had gone down to 1,640 acres. After 1913, under the pressure of the difficulties created by the world war 1914-18, there had been a new increase which lasted only a few years, and a maximum 3,665 acres of was registered in 1919. The almost total absence of colza in Belgium when the present war started, is to be attributed partly to the lack of sufficient outlets open to colza oil, and partly also to the very aleatory character of this crop which is very sensitive to unfavourable weather and quite easily subject to the attacks of insects and maladies. Results obtained so far are very modest. The area sown to colza increased from 77 acres in 1941 to 1,134 in the following year. Unit yields in the five years 1934 to 1939 averaged 1,780 lbs per acre.

The measures taken by the competent authorities to increase the production of colza may be summarised as follows: the prices of seeds of the 1942 crop have been fixed at 650 frs. per quintal.; those of 1943 crops (including premiums) to 1.000 frs a quintal. It has also been foreseen a supplementary grant of nitrate fertilizers to colza producers in the measures of 54 lbs. per acre above ordinary quantities in 1942, and of 107 in 1943. In 1943, to these grants will also be added 357 of basic slag. In 1942 and 1943 colza producers will also receive some oil cakes at official prices 55 lbs in 1942 and 110 lbs in 1943 for each 220 lbs of colza seeds delivered. Finally, in 1942, for each 45 lbs of linseed over the amount foreseen by the plan, producers will be granted a litre of oil at official prices. In 1943, for each 225 lbs of colza seed, they will receive 2 litres of table oil, up to a maximum of 50 litres, to be paid also at official prices.

Under present circumstances, according to information sent by the Government to the Institute, there is very little possibility that there may be an increase

of the culture of other oleagineous crops in this country. As regards soya, the results of efforts made so far are not such as to allow drawing a conclusion on the opportunity of increasing its culture.

In 1940, according to unofficial sources, linseed which (as has already been mentioned) is the chief resource of the country for the production of vegetal oils, covered an area nearly equal to that of 1939; this area decreased to about 37,000 acres in 1941 and 24,700 acres in 1942.

In 1943, farmers who in 1941 raised some linseed, are obliged to sow to this crop an area at least 10 per cent bigger than in 1941.

Some retrospective information on oleagineous cultures in *France* may be useful to better understand and appreciate the present situation. In 1862 when the acreage sown to herbaceous oleagineous crops had reached its maximum, colza covered 500,000 acres, rape-seed 100,000, and poppy-seed 119,000. Moreover, 272,000 acres were cultivated to hemp and 259,000 to flax, Altogether, the total area sown to oil giving plants amounted to about 1,250,000 acres. In the next period, owing to the competition of exotic oleagineous seeds, this acreage began to decrease steadily. In 1914, it had fallen down to about 153,000 acres, and it may be said that it remained at the same level in the course of the first years after the 1914-18 world war.

As regards oleagineous crops other than flax and hemp, the situation on the eve of the present conflagration and its further development, results from the following official statistics:

Crop	Acreage (acres)				Production (metric tons)			
	1938	1940	1941	1942	1938	1940	1941	1942
Colza	19,020	15,310	23,000	37,850	8,680	6,220	9,120	...
Rap-seed	5,570	5,300	10,590	14,740	1,890	1,430	2,640	...
Poppy-seed	210	590	3,960	10,040	80	200	1,200	...
Sunflower	...	...	...	19,490	...	...	...	...
Other crops	...	...	...	2,890	...	...	...	...

The total area to these cultures decreased from 24,800 in 1938 to 21,200, acres in 1940, but is increased, right afterwards to 37,550 acres in 1941 and 85,490 in 1942. A special mention must be made of the introduction of the culture of sunflower which, already in 1942 covered a considerably important place, and of the appearance of the group of other cultures, among which soya probably holds a pre-emenent position.

No official data are available on flax and hemp during the war years: in 1938 the area to flax amounted to about 94,000 acres, and that to hemp about 8,650 with a production of, respectively, 8,300 metric tons and 300 metric tons. It is estimated, that in order to meet the needs on the country for vegetal oils- on the basis of a monthly ration of 9 ounces a head, and taking into account the fact that the production of olive oil in the five years 1934 to 1938 amounted

to 5,600 metric tons – France should sow about 740,000 acres to herbaceous oleagineous plants. In 1942/43 the French Government intends to increase the area sown to these crops to 222,000 acres.

While a very active propaganda was carried on, prices were fixed at high levels in order to further encourage the increase of areas to oleagineous crops.

Average prices per quintal of oleagineous seeds in francs.

	1938	1940	1941	1942
Colza	233	452	600	800
Rapeseed	227	584	600	800
Poppy-seed	189	638	900	900
Sunflower	...	...	600	600

Farmers who are willing to sign contracts for the culture of oil-giving plants with certain specified organisations (Comité d'Organisation des Corps gras, Société National des Chemins de Fer, etc.) are granted also production premiums of 300 frs. for colza, rape and poppy-seeds, and 250 frs. for the seeds of sunflower.

An idea of the relation between the price of oleagineous seeds and wheat may be gotten by remembering that, at the beginning of the season, viz., in the month of August, farmers received for soft wheat a total price (including premiums, additional premius, etc.) of 300 frs., per quintal in 1941 and 404.50 frs in 1942.

Farmers who sign contracts for the delivery of oleagineous seeds at central storage–house, are allowed other advantages, such as, for instance, a certain amount of oil for each person living in the house of the head of the holding, the right to buy all the oil cakes corresponding to the seeds at normal price, and finally the priority of delivery of their production.

In order to increase the production of oil, measures have also been taken to exploit resources which heretofore were ultilised only in part or not at all. In this connection, since September 1940, the Government had already issued some decrees concerning the conservation of grape stones for the extraction of oil. It is estimated that these stones could yield about 22,000 metric tons of oil viz., a quantity actually obtainable against a theoretical production of 45,000 metric tons.

It may finally be mentioned that, in order to encourage the culture of olive trees, in 1941 some premiums had been allowed for regeneration or grafting and for new plantations in the measure of 5,85 and 11,70 frs. per tree, respectively. In 1942, up to 4 million frs. were distributed for this purpose.

In 1939, the most important part of the home production of oleagineous seeds in the *Netherlands* was constituted by linseed (22,500 metric tons), followed, in order of importance, by poppy-seed (4,300 metric tons), mustard (2,000 metric tons), and colza (700 metric tons). It must be noticed, however, that in the preceding years the area on colza averaged about 5,000 acres. Yields per acre of these crops are among the highest registered in Europe.

Total area under these crops in the same year 1939 amounted to about 72,300 acres, including 61,570 acres under flax, 6,770 under poppy, 3,110 under mustard, and 840 under colza.

The grave crisis in the supply of oleagineous seeds on account of the war, induced the Government to give its greatest attention to the culture of colza which, not only assures higher yields per acre than flax — cultivated especially for the production of fibre — but allows a wider possibility of expansion. Colza, in fact, for a number of years had covered a rather important area (about 71,700 acres as an average in the ten years 1851 to 1860); but after that period (as it was happening also in a number of other European countries), its culture had began to decrease steadily, and in 1913 it covered only 3,190 acres. There was an improvement during the first world war, and in 1919 the area to colza reached again a maximum of 19,550 acres; but this improvement was only temporary.

Agricultural holdings of over 5 hectares (12 acres), are obliged to sow on colza from 5 to 8 per cent of their arable land, according to the nature of the soil. Heavy fines are threatened for farmers who disregard these orders, and, in some cases, they may be forced to cultivate on poppy-seed, if the nature of the soil allows it, a larger area than they would have had to sow to colza.

Farmers are obliged to deliver all their production of oleagineous seeds. Fixed base prices are paid to producers for a product of average quality, cleaned at the farm. These prices are increased each week by a supplement for storage.

From 1940 to 1942, base prices, in florins per quintal, were as follows: 16,50 in 1940, 20,0 in 1941 and 1942 for colza; 14 in 1940 and 15 in 1941 and 1942 for linseed; 40 for poppy-seed in 1942. In 1942, culture premiums of 15 florins were allowed on colza and 20 on poppy-seed.

For comparison, sake it may be mentioned that the wheat base price in 1941 and 1942 was 13,25 florins per quintal.

According to information sent by the Government to the Institute, in the season 1942/43, an area of 185,000 acres must be ploughed and cultivated; meadow colza and rapeseed, which at present are the most important oleagineous crops in the country, will be sown over an area of 124,000 acres, which considerably larger than that of the preceding season.

Countries of South-Western Europe.

In *Portugal*, where the production of olives in the five years 1935 to 1939 averaged 53,000 metric tons. the culture of oleagineous plants was almost unknown before the present war. It is true that the effects of the war have not hit Portugal with the same force as nearly all the other European countries, so that the problem of the introduction of these cultures into that country did not appear very urgent. But according to some unofficial information, a first attempt at the introduction of linseed was started in 1941.

Spain, which holds the first place among olive oil producing countries (in the years 1935 to 1939, its average production amounted to about 380,000 metric tons a year) has devoted a certain part of its land to herbaceous oil-giving plants.

Unfortunately the most recent available official statistics go back to 1935, in which year the situation was as follows:

	Area (Acres)	Production (metric tons)
Groundnuts	23,640	21,200
Cotton	60,590	5,300
Hemp	8,860	800
Flax	1,570	200

According to press information, the area sown on linseed in 1940 amounted to 8,850 acres against 5,360 acres in 1939. The area to cotton in 1939 was estimated at 47,000 acres. In 1941, the Spanish Government, in order to encourage the increase of acreage to this crop, granted some premiums for cotton produced on uncultivated land. These premiums were fixed at 0,23 peseta per lb. of fibre for all the cotton production above average yields of 1938, on condition, however, that it should be obtained on fallow or uncultivated land. At the beginning of 1942, the Government issued a decree for the introduction of the culture of sunflower to be sown on a total area of 124,000 acres in a certain number of regions particularly good for these crops. Farmers who cultivate sunflower are favoured in the matter of getting seeds and fertilizers, and they are entitled to 10 lbs of olive oil for every 100 lbs of sunflower seeds delivered, up to a maximum of 44 lbs. of oil for each member of their family. They are also entitled to the same treatment as producers of olive oil.

Already before the civil war, olive planters had begun a work of rejuvenescence and regeneration of their olive trees and new trees were planted. After the civil war, which meant the loss of about 200,000 acres of olive plantations to Spanish oleiculture, the Government took measures intended to give the maximum impulse to this work, which, in late years, had become even more urgent than before.

Until a few years ago, in *Italy*, which in 1935-1939 occupied the second place among the olive oil producing countries of the world, with 228,000 metric tons a year, the herbaceous oil-giving plants, although they were represented by a rather large number of species, covered a limited area. In 1938 the last for which complete statistics are available, and in the next two years, the situation was as follows:

Crop	Area (acres)			Production (metric tons)		
	1938	1939	1940	1938	1939	1940
Hemp	218,480	224,540	226,690	2,800	4,530	5,000
Cotton	91,780	97,830	159,370	14.600	13,550	18,480
Flax	26,870	...	...	6,500	...	...
Colza	2,460	2,450	...	500	1.100	...
Rapeseed	1,590	1,900	...	600	800	...
Groundnuts	1,990	2,110	3,330	1,700	1,830	2,750
Sesame	1,070	1,130	1,160	300	440	310
Sunflower	40	...	...	...	...	...
Soya	30	...	...	...	...	...

The table shows that the total area to oleagineous crops in 1938 (excepting the acreage to castor plant for which statistical data are lacking) amounted to 343,500 acres. The rapid increase of the area sown on cotton is evidenced by the data available for the years 1939 and 1940: in fact from 9,900 acres in 1939, it jumped the following year to 158,000 acres, with production of 18,500 metric tons of cottonseeds. Thus cotton seed rose to the first place among the products of herbaceous oil-giving plants. The necessity of allowing a larger area to these plants including some comparatively recent ones (groundnuts, sunflower, soya) became urgent in Italy a few years before the present war. The foundation of the " National Association of Growers of herbaceous oil-giving Plants ", the experimentation of some species and varieties in different parts of the country, a systematic propaganda among farmers to acquaint them with the results of these experiments, had already prepared the field for a more intense work in favour of these crops. This necessity became more urgent as a consequence of the conditions created by the war.

In 1942, the Ministry of Agriculture and Forests, in order to give a greater impulse to oleagineous cultures, created a special Committee for the study and co-ordination of experiences on herbaceous oil-giving plants. The members of this Committee are technicians and experts of special competence in this field.

Besides some cultures, as colza and rapeseed, that had been generally cultivated in the past and had later been somewhat abandoned, the attention of the Committee concentrated on sunflower, soya, groundnuts and linseed, without mentioning castor-oil which had already an important place among such crops in many Italian regions. From a technico-agricultural point of view, the possibilities of success—according to climate and soil conditions in the different zones—could be found partly in the increase of these cultures over fallow land and prairies, partly in their substitution to other crops, and finally in the spreading of the practice of second crops over land which, in the same year, had already been utlised for another crop. Some oleagineous plants, such as colza and soya, on account of their vegetative cycle, are particularly fit for this purpose. It was also hoped to obtain considerable results by associating oil-giving plants, especially sunflower, with other crops.

Since 1941, the Ministry of Agriculture and Forests, by a decree of August 24, after consulting competent institutions, fixed each year the area to be devoted to the production of oleagineous seeds and fruit in each province. After the harvest of 1941, all the oleagineous seed produced in the country which are previously indicated by the Ministry of Agriculture and Forests—(the list published in May 1942 may be said to cover all the oleagineous seeds produced in Italy)—must be declared to the Provincial Branches of the National Association of the Growers of herbaceous oil-giving plants or to other authorised organisations, and delivered to the central storage—houses.

The Plan of the Ministry of Agriculture and Forests for the 1942-43 season establishes that the area to be destined to oleagineous crops must be larger than the already notable one of the preceding agricultural year. The plan, among other things, foresees the final abandonment of fallow land.

Besides oleagineous seeds, other considerable reserves existed in Italy which could furnish oil and heretofore had been made use of but little or not at all for this purpose. Now, by Governmental decree, their utilisation for the production of oil is made obligatory. According to some estimates, the grape—stones could yield about 20,000 metric tons of oil a year. In 1941, the yearly average production of grape—stones was estimated at 180,000 metric tons of which 100,000 were already used for the production of oil. By exploiting other resources, such as the seeds of tomatoes which are a sub-product of the tomato canning industry, the seeds of tobacco, the sprouts of maize—which are available now in greater quantities as a consequence of their employment in bread making—the husks of rice etc., it is estimated that about 10,000 metric tons of oil could be added to present production.

For the sales of oleagineous seeds of the 1941 production by the central storage—houses the Government fixed the following prices in Italian lire per quintal: L. 580 for first quality castor-oil seeds, shelled; L. 382 for castor-oil seeds, unshelled; L. 390 for linseed; L. 380 for colza and rape-seed; and 110 lire for grape—stones. The price of colza seeds was about double that of wheat. A premium of L. 200 a quintal of first quality castor-oil seeds has been granted on the 1942 production.

By a decree of October 3 1942, the Ministry of Agriculture and Forests, in order to give the utmost impulse to the culture of colza, rape-seed and sunflower, has established that farmers that grow the above mentioned plants, at the moment of the delivery of their production of oleagineous seeds to central storage—houses, may receive a quantity of eatable oil in the measure of 2 lbs. for each 100 lbs of seeds delivered, up to a maximum of 7 lbs for each member of the family of the producer. This grant is allowed in addition to the ration to which consumers are entitled and independently of the quantity of olive oil coming by right to olive-oil producers.

Oleiculture has also been encouraged. Since 1933, the Government, besides reimbursing 30 per cent. of expenses for the setting of the land or the grafing of wild olive trees, fixed a maximum premium of 4 lire for each new olive tree that has taken. In latest years, the work of rejuvenation of olive trees was further aided by the Oleiculture Section of the National Provincial Federation of Agricultural Producers, which sent to olive farms a considerable number of specialised labourers, who in the years 1938 and 1939, treated about 1,150,000 olive trees and whose work is expected to progressively extend over 1/3 of all the land to olive trees in Italy.

(to be continued).

STATISTICS ON CEREAL PRODUCTION

Since the beginning of the war, harvest statistics became inevitably very irregular. Moreover, owing to the difficulties of communications which hinder all direct correspondence with official sources of information, the data reaching the Institute often come indirectly from commercial sources. Therefore

Wheat. — *Production.*

COUNTRIES AND CONTINENTS	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
France	...	(1) 165,000	(1) 95,000	(1) 160.830	181,070	...	(1) 276,000	(1) 158,000	(1) 268,040	301,770
Italy	...	157,682	156,624	175,971	160,488	...	262,798	261,034	293,280	267,475
Germany (2)	...	...	...	123.757	113,360	...	...	...	206,257	188,929
Spain	(3) 65,120	65,376	47,649	63,271	(4) 78,990	(3) 108,540	108,958	79,413	105,449	(4) 131,650
Romania	...	(5) 43,048	(5) 30,331	98,168	74,045	...	(5) 71,745	(5) 50,551	163,610	123,405
Yugoslavia	...	...	41,597	63,396	53,570	...	...	69,327	105,658	89,822
Hungary	...	...	(6) 45,581	(7) 67,863	48,934	...	...	(6) 75,966	(7) 113,103	81,555
Bulgaria	...	...	37,093	41,400	35,007	...	...	61,820	69,000	58,344
Greece	(3) 7,700	...	20,500	22,974	16,616	(3) 12,900	...	34,200	38,290	27,693
Sweden	10,121	7,300	9,275	18,980	15,474	16,869	12,166	15,458	31,632	25,790
Finland	3,724	(8) 3,426	(8) 3,940	5,102	3,580	6,206	(8) 5,710	(8) 6,566	8,502	5,967
Europe	...	(4) *900,000*	(4) *790,000*	*1,025,000*	*958,000*	...	(4) *1,500,000*	(4) *1,320,000*	*1,709,000*	*1,598,000*
U. S. S. R. (in Europe and Asia)	...	...	...	...	792,284	...	...	...	...	1,320,448
United States	570,000	567,551	490,030	450,871	430,434	960,000	945,900	816,700	751,437	717,376
Canada	364,613	179,404	330,840	312,381	158,070	607,688	299,001	551,389	520,624	263,444
North. and Centr. America	*945,000*	*756,000*	*829,000*	*772,500*	*595,900*	*1,575,000*	*1,260,000*	*1,382,000*	*1,287,500*	*993,200*
Argentina	...	134,000	162,706	71,670	146,260	...	224,000	271,171	119,450	243,750
South. America (9)	...	*170,000*	*195,100*	*106,300*	*181,400*	...	*283,000*	*325,200*	*177,100*	*302,400*
India	...	224,405	241,564	223,172	219,740	...	374,001	402,598	371,197	366,226
Turkey	...	...	92,222	92,685	75,235	...	...	153,700	154,472	125,390
Japan	30,605	32,284	39,681	36,6[illegible]	28,468	51,008	53,805	66,134	61,085	47,466
Palestine	2,400	2,090	3,000	1.960	1,929	4,000	3,490	5,000	3'270	3,215
Asia (10)	...	(4) *400,000*	*421,300*	*400,100*	*420,200*	...	(4) *660,000*	*720,200*	*666,900*	*700,300*
Egypt	27,815	24,776	29,996	29,405	26,101	46,357	41,292	49,993	49,008	43,500
Algeria	...	19,200	16,561	25,600	20,999	...	32,000	27,600	42,600	34,998
Africa (11)	...	(4) *90,000*	*79,000*	*100,800*	*81,400*	...	(4) *150,000*	*132,000*	*167,900*	*135,600*
Australia	...	96,508	49,593	126,093	92,597	...	160,843	82,654	210,160	154,325
Oceania	...	*102,500*	*54,700*	*131,000*	*96,600*	...	*170,900*	*91,100*	*218,300*	*160,900*
WORLD TOTAL (12)	...	(4) 2,394,000	2,372,000	2,535,800	2 334,300	..	(4) 3,990,000	3,954,000	4,226,200	3,890,[illegible]

(1) Not including Alsace-Lorraine. — (2) Including Austria. — (3) Unofficial figure. For Greece: present territory. — (4) Partly estimated. — (5) Territory as after all territorial transfers occurred in 1940. — (6) Including the reannexed northern zone and Sub-Carpathia. — (7) Including the reannexed northern zone, without Sub-Carpathia — (8) Not including the territories transferred to the U. S. S. R. in 1940. — (9) Not including Ecuador and Venezuela. — (10) Not including China, Iraq and Iran — (11) Not including Italian East Africa and Spanish Morocco. — (12) Not including the U. S. S. R. and the countries under notes (9), (10) and (11).

they must be accepted with caution as they may not be entirely correct. A reliable comparison of the statistics of countries that have undergone territorial changes is also impossible. All these difficulties induced the Institute, some time back, to stop the publication in this Bulletin, of customary tables of acreages and production of the different agricultural staples, and to confine itself to the printing of information on production whenever it could be obtained. This information, naturally, was scattered over the different Bulletins and could not be properly tabled. Prompt international comparisons were also out of the question.

Rye. — *Production.*

COUNTRIES AND CONTINENTS	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
Germany (1)	...	...	...	208,443	179,860	...	...	...	372,221	321,180
Poland	—	—	—	168,200	142,578	—	—	—	300,400	254,604
Czechoslovakia	—	(2) 4,409	(2) 4,403	(2) 5,318	35,226	—	(2) 7,874	(2) 7,862	(2) 9,496	62,903
France	...	...	...	(3) 16,600	16,973	...	...	...	(3) 29,640	30,310
Hungary	...	...	(4) 15,964	(5) 19,041	15,360	...	...	(4) 28,507	(5) 34,003	27,428
Lithuania	...	...	...	14,533	13,594	...	...	...	25,952	24,275
Spain	(6) 14,478	8,755	7,740	9,041	(7) 9,883	(6) 25,853	15,633	13,822	16,145	(7) 17,647
Sweden	9,533	6,113	5,862	7,796	9,024	17,023	10,917	10,468	13,921	16,114
Finland	4,480	(8) 5,140	(8) 4,628	6,737	8,168	7,990	(8) 9,170	(8) 8,263	12,031	14,586
Europe	...	...	...	*540,000*	*494,900*	...	...	...	*965,000*	*883,800*
U. S. S. R. (in Europe and Asia)	...	...	...	...	484,295	...	...	...	...	864,816
United States	33,041	25,307	22,736	21,868	23,116	59,002	45,191	40,601	39,050	41,278
Canada	13,834	7,374	7,837	8,572	3,960	24,703	13,167	13,996	15,306	7,071
North. and Centr. America	*46,875*	*32,681*	*30,574*	*30,439*	*27,075*	*83,705*	*58,358*	*54,596*	*54,356*	*48,348*
Argentina	...	3,100	4,678	10,850	5,168	...	5,500	8,354	19,370	9,228
South. America	...	...	...	...	*5,700*	...	...	...	...	*10,200*
Asia: Turkey	...	...	*10,650*	*9,026*	*7,397*	...	...	*10,019*	*16,117*	*13,208*
Africa	...	...	...	*400*	*400*	...	...	...	*800*	*800*
WORLD TOTAL (9)	...	...	...	591,000	536,000	...	...	...	1,055,000	957,000

(1) Including Austria. — (2) Slovakia. — (3) Not including Alsace-Lorraine. — (4) Including the reannexed northern zone and Sub-Carpathia. — (5) Including the reannexed northern zone without Sub-Carpathia. — (6) Unofficial figure. — (7) Partly estimated. — (8) Not including the territories transferred to the U. S. S. R. in 1940. — (9) Not including the U. S. S. R.

In spite of these inevitable gaps and faults of present documentation, it was now deemed opportune to resume the publication of tables on the production of the chief agricultural staples. But their shape has been adapted to changed circumstances, in order that they may furnish —even if in an imperfect and approximate manner—an indication on the results of harvests in the latest years, and at the same time, contain the available estimates on the 1942 production.

Barley. — *Production.*

Countries and Continents	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
Germany (1)	...	...	...	93,957	85,189	...	...	...	195,747	177,480
Spain	(2) 34,895	37,146	30,768	31,260	(2) 39,813	(2) 72,699	77,388	64,101	65,130	(3) 82,946
Poland	—	—	—	32,600	31,116	—	—	—	68,000	64,826
Czechoslovakia	—	(4) 5,840	(4) 6,720	(4) 6,583	24,509	—	(4) 12,170	(4) 14,000	(4) 13,715	51,061
Denmark	...	20,500	25,104	27,040	23,900	...	42,700	52,301	56,334	49,793
France	...	...	...	(5) 29,920	23,673	...	...	...	(5) 62,330	49,320
Romania	...	(6) 9,608	(6) 10,944	17,999	22,736	...	(6) 20,017	(6) 22,800	37,498	47,368
Sweden	4,888	3,477	4,173	5,108	4 890	10,183	7,243	8,695	10,642	10,200
Finland	(7) 3,175	(7) 2,910	(7) 3,060	4,156	4 158	(7) 6,614	(7) 6,063	(7) 6,375	8,658	8,663
Europe	...	...	...	*348,800*	*338,900*	...	...	...	*726,600*	*706,000*
U. S. S. R. (in Europe and Asia)	...	...	...	...	190,211	...	...	...	...	396,280
United States	200,588	172,177	148,431	131,885	98,232	417,900	358,709	309,237	274,766	204,653
Canada	124,432	56,457	50,043	49,509	38,881	259,234	117,619	104,258	103,146	81,003
North. and Centr. America	*326,000*	*231,000*	*201,000*	*183,540*	*138,830*	*680,000*	*482,000*	*418,000*	*382,370*	*289,220*
Argentina	...	8,200	17,390	18,764	11,019	...	17,000	36,240	39,092	22,956
South. America (8)	...	...	...	*22,700*	*15,700*	...	...	...	*47,300*	*32,600*
India (Britisch Provinces)	...	...	...	...	52,168	...	...	...	...	108,686
Turkey	...	...	49,712	50,590	43,217	...	...	103,569	105,397	90,038
Japan	36,516	36,069	37,199	39,201	34,300	76,077	75,144	77,499	81,669	71,459
Chosen	...	...	...	27,313	25,664	...	...	...	56,903	53,468
Asia (9)	...	...	...	*182,300*	*165,600*	...	...	...	*379,800*	*344,900*
French Morocco	...	...	...	46,910	25,300	...	...	...	97,740	52,710
Algeria	...	15,360	7,919	24,000	15,523	...	32,000	16,498	51,000	32,340
Africa (10)	...	...	...	*85,910*	*50,900*	...	...	...	*178,990*	*106,100*
Oceania	...	...	...	(11) *6,000*	*5,300*	...	...	...	(11) *12,400*	*11,000*
World total (12)	...	...	...	**829,200**	**715,200**	...	...	...	**1,727,400**	**1,490 000**

(1) Including Austria. — (2) Unofficial figure. — (3) Partly estimated average. — (4) Slovakia. — (5) Not including Alsace-Lorrainse. — (6) Territory as after all territorial transfers occurred in 1940. — (7) Not including the territories transferrend to the U. S. S. R. in 1940. — (8) Non including Peru. — (9) Not including China, Iran and Iraq. — (10) Not including Spanish Morocco and Italian East Africa. — (11) Estimate. — (12) Not including the U. S. S. R. and the countries under notes (8), (9) and (10).

Therefore, for each product have been assembled the statistics of the most important producing countries, covering the five years preceding the present war (averages from 1934 to 1938), and each of the years 1939 to 1941. Besides the few available estimates for 1942, have also been tabled the approximate totals for the various continents and the whole world. As regards the producing countries of lesser importance, we have tabled only those for which the estimated figures of the 1942 production are available. So far, these figures are very few; but their list may increase when new estimates for 1942 reach the Institute.

Oats. — *Production.*

COUNTRIES AND CONTINENTS	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
Germany (1)	...	...	...	151,407	133,786	...	...	...	473,145	418,078
France	...	...	...	(2) 116,210	100,789	...	...	...	(2) 363,140	314,964
Poland	—	—	—	63,500	56,386	—	—	—	198,400	176,204
United Kingdom	...	...	...	38,819	44,503	...	...	...	121,309	139,070
Sweden	20,470	17,101	20,660	28,023	27,853	63,968	53,441	64,561	87,571	87,041
Czecoslovakia	—	—	(3) 4,597	(3) 3,754	27,282	—	—	(3) 14,364	(3) 11,733	85,257
Denmark	...	16,300	19,641	21,921	22,198	...	51,000	61,378	68,502	69,370
Finland	12,214	(4) 10,626	(4) 11,129	16,936	16,010	38,167	(4) 33,207	(4) 34,778	52,925	50,031
Spain	(5) 13,276	12,469	10,459	10,549	(6) 11,880	(5) 41,488	38,967	32,683	32,966	(6) 37,130
Europe	...	...	...	*584,700*	*549,000*	...	...	...	*1,827,100*	*1,715,000*
U. S. S. R. (in Europe and Asia)	...	...	...	...	394,272	...	...	...	...	1,232,090
United States	426,240	376,357	395,403	299,503	304,179	1,332,000	1,176,107	1,235,624	935,941	950,554
Canada	221,672	120,138	129,379	130,697	110,639	692,724	375,430	404,306	408,425	345,746
North. and Centr. America	*648,000*	*496,570*	*524,860*	*430,260*	*414,890*	*2,025,000*	*1,551,770*	*1,640,160*	*1,344,540*	*1,296,520*
Argentina	...	9,900	11,894	19,238	16,367	...	31,000	37,168	60,117	51,147
South. America	...	...	...	*22,310*	*20,100*	...	...	...	*69,720*	*62,700*
Asia (7)	...	...	...	*12,100*	*10,000*	...	...	...	*37,900*	*31,700*
Africa	...	...	...	*8,970*	*6,640*	...	...	...	*28,040*	*20,740*
Oceania	...	...	...	(8) *8,600*	*7,900*	...	...	...	(8) *26,900*	*24,800*
WORLD TOTAL (9)	...	...	...	**1,066,800**	**1,008,600**	...	...	...	**3,333 800**	**3,151,900**

(1) Including Austria. — (2) Not including Alsace-Lorraine. — (3) Slovakia. — (4) Not including the territories transferred to the U. S. S. R. in 1940. — (5) Unofficial figure. — 6) Partly estimated average. — 7) Not including China and Manchukuo. — (8) Estimate. — (9) Non including the U. S. S. R. and China.

Thus these tables will contain all the information on the results of 1942 possessed by the Institute at a given time, and they will find their proper place in the synthetic survey of world production in the latest years. The tables contained in this issue concern wheat, rye, barley, and oats. Other agricultural products will be considered in future issues.

The totals relative to different continents and the whole world after the year 1939, could be estimated only for wheat. They must be considered as only reasonably approximate.

As usual, owing to the lack of complete statistics, world totals do not include a certain number of countries, among which the most important are the U. S. S. R. and China.

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE BARLEY AND OATS.

Bulgaria: Abundant rainfalls towards the middle of October were very favourable to sowings of winter cereals, which by the beginning of November were over almost everywhere.

Spain: In most Spanish regions the weather during the month of October was favourable to sowings. Although plowing was delayed in some zones, and especially in Andalusia and Levant, it was generally helped by rains. The germination of wheat is very regular.

Finland: The 1942 production of meslin is estimated at 132,300 centals (228,000 bushels) against 205,000 centals (353,500 bushels) in 1941. Percentage: 64.5 per cent.

In October the temperature was above normal. Rainfalls were rather scarce at the beninning of the month, but became very frequent in the last two weeks. Weather conditions were unfavourable to the gathering in of the crops. Preparatory work for winter sowings were done in good conditions.

Hungary: In the first decade of the month of October, the weather was very warm, dry and sunny, while in the second decade it was rather fresh and rainy. Sub-soil humidity was below average in nearly 3/4 of the country. Towards October 24, threshing of cereals was ended nearly everywhere. With the exception of some eastern departments, the preparation of the soil and Autumn sowings were done slowly and with difficulty on account of the drought. Sowing of barley was done under particularly unfavourable conditions. According to a statement of the Ministry of Pubblic Supplies issued at the end of the first week in November, Autumn sowings were over nearly everywhere.

Sowings had been started towards the beginning of October after the first rainfalls, following the heavy summer drought. All over the country, sown acreage is at least equal to last year. It must be remarked that also small landowners have sown an acreage equal and in some places, even bigger than last year. The spots where cereal sowings have been smaller than last year are very few. Such decreases are due to the increase of the acreage devoted to oleagineous plants. Small landowners are making heavy demands for fertilizers.

Italy: Rain in the latter part of October was favourable to cereals that had already been sown. Rains and comparatively mild temperature helped the germination and vegetation of cereal crops.

According to the production plan prepared by the Ministry of agriculture for the 1942-43 season, it is foreseen that, compared with this year, the area to cereals will be increased as follows: wheat 530.000 acres; rye, barley and oats together, 64,000 acres.

Romania: A lasting drought has much delayed plowing and sowings of winter cereals. The last week in October, however, and the first two weeks in November were generally favourable to sowings. Intense publicity and the largest assistance by agricultural and administrative authorities have made it possible for farmers to take the utmost advantage of the periods of favourable weather. Thus, towards the middle of November it was ascertained that the condition of the crops was good. At that date, the sown acreage was 50 per cent. higher than at the corresponding date in 1941. The Ministry of Agriculture is preparing the program of the 1943

Spring sowings. The Government has authorised the Ministry of Agriculture to contract a loan of ½ milliard *lei* for the purchase and distribution to farmers of selected seeds, and fertilizers.

Serbia: The Government plan for the reorganisation of Serbian agriculture, establishes that wheat must come right after maize among the crops for which an increase of acreage has been decided. This Fall, at least 1,235,000 acres must be sown to wheat. This acreage is about ¼ of the total area sown to this crop in former Yugoslavia. Farmers have been instructed to employ the best seeds in order to obtain the best possible production of wheat.

As regards the other cereals, the plan has fixed the following acreages: oats 158,000 acres, Winter and Spring barley 99,000 acres, (of which 9,000 to brewery barley), Winter and Spring oats 69,000 acres.

Slovakia: In 1942-43, Governmental regulations have forbidden all acreage modifications for the different cereals. The 1941-42 acreages must be maintained, except in the case of barley for which up to five per cent. of total area may be sown to maize. If the crops are heavily hit by winter cold, they must be sown over again or, if this is impossible, areas winterkilled will be sown to barley, millet or oats. Agricultural holdings of not less than 30 hectares (75 acres), must sow to cereals not less than 50 per cent. of their acreage.

Sweden: The production of meslin in 1942 has been estimated at 11,923,000 centals (20,557,000 bushels), against 9,281,000 centals (16,001,000 bushels) in 1941 and an average of 12,177,000 centals (20,995,000 bushels) in the five preceding years: percentages, 128.5 and 97.9.

Argentina: According to the fourth estimate wired by the Argentine Ministry of Agriculture to the Institute on November 21, the area sown on cereals in 1942-43 compared respectively with the figures of the preceding season and the average for the quinquennium ending in 1940/41, is shown in the table below:

Area sown on cereals.

(1,000 acres)

	1942-43	1941-42	Average 1936-37 to 1940-41	% 1942-43: 1941-42 = 100	% 1942-43: Average = 100
Wheat	16,433	18,039	19,336	91.1	85.0
Rye	2,481	2,661	2,711	93.2	91.5
Barley	1,878	1,972	1,943	95.2	96.7
Oats	3,548	3,519	3,757	100.8	94.5

The new estimates indicate a slight increase over the figures published last month. Yet they are lower than the average for the five years ending in 1940/41 (except for oats) and also than the figures of the preceding season. The considerable reduction registered especially in the case of wheat, must be attributed to the existence in the country of large unsold stocks from the two preceding seasons, of which, owing to the war, only very small amounts could be exported.

(Telegram of December 2): The condition of the wheat crop is generally good all over the country.

Canada: According to the Dominion Bureau of Statistics production of spring wheat in the Prairie Provinces amounts to 348 million centals (580 million bushels) compared to 167 (279) last year and 206 (343) on the average during the 5-year period 1936-40; percentages: 207.9 and 169.2. The details are: Manitoba, 31 million centals (52 million bushels); Saskatchewan, 207 (345); Alberta, 110 (183).

Egypt: Area cultivated to millet in 1942 amounted to 726,800 acres against 341,000 in 1941 and about 379,600 on the average during the 5-year period 1936-40; percentages: 213.2 and 191.5. The corresponding production amounts to 19,834,000 centals (39,667,000 bushels) compared with 8,787,000 (17,574,000) in 1941 and 10,019,000 (20,038,000) on the average; percentages: 225.7 and 198.0.

CURRENT INFORMATION ON MAIZE.

Hungary: Towards October 20, maize harvesting was almost over. Ripening was generally good, and storing has been done in good conditions. In flooded and sandy soils, there have been frequent cases of whitewashing. In some places, ears were un developped, even on fertile soils, and the formation of seeds on the second and third ear was defective.

Italy: According to the production plan prepared by the Ministry of Agriculture for the year 1943, it is foreseen that the area under maize will be increased by 270,000 acres as compared with last year.

Romania: Owing to the drought, maize had completely ripened by the end of October and harvest was practically over. The degree of humidity of the grains is exceptionally low.

Serbia: According to recent reports, this season over one half of arable acreage will be sown to maize. The plan prepared by the Government for the new agricultural organisation, shows that in the Spring 1943 the maize area should amount to 2,039,000 acres, viz., to about ⅓ of the acreage under maize in old Yugoslavia. In order to obtain this result, all the land that, for any reason whatever may be uncultivated, must be dedicated to maize. Moreover, wherever possible, maize must be grown also as an associated crop among beans, pumpkins and squashes.

CURRENT INFORMATION ON RICE.

Chile: In later years, the rice crop has considerably increased. According to press information, rice production in 1942 amounted to 1,354,000 centals (3,008,000 bushels) which is enough to entirely cover the home needs of the country.

Taiwan: The production of first rice crop in 1941-42 is estimated at 15,548,000 centals (34,551,000 bushels) against 17,267,000 (38,370,000) in 1940-41 and an average of 18,328,000 (40,727,000) in 1935-36 to 1939-40; percentages, 90.0 and 84.0.

CURRENT INFORMATION ON POTATOES.

Finland: Potato production in 1942 is estimated at 21,385,000 centals (35,641,000 bushels), against 17,483,000 centals (29,137,000 bushels) in 1941. Percentage: 122.3.

Hungary: By October 20, potato pulling was almost over. In many places, tubers are not well developed.

Italy: According to the production plan prepared by the Ministry of agriculture, the area to potatoes in the coming season should be bigger than that of the preceding season by 84,000 acres.

According to private information, the production of potatoes this year is estimated at 75-77 million centals or 125-129 million bushels against an average of 66 million centals or 110 million bushels in the years 1936-40.

Romania: As compared with 1941, the area to potatoes in 1942 has been considerably increased. In some regions, however, yields were reduced on account of the long drought. But the increased area has compensated losses, so that, for the country as a whole, production has been by 4,400,000 centals (7,350,000 bushels) larger than in 1941.

Serbia: Until 1941, the acreage to potatoes amounted to about 49,000 acres: in 1942 it was doubled. But delayed sowings and the long drought so compromised yields as to make the 1942 production of potatoes insufficient to cover the needs of the country. In order to prevent a repetition of this inconvenience, the Government plan for the reorganisation of Serbian agriculture provides for an increase of the acreage to be sown to potatoes in 1943, up to the amount of 124,000 acres. In order to obtain this result, the Ministry of Agriculture and Supplies has made it obligatory for all large and small agricultural holdings to devote a part of their land to the potato crop. Farmers must also provide by themselves the potatoes for seeding.

Sweden: Potato production in 1942 is estimated at 42,858,000 centals (71,429,000 bushels) against 45,660,000 centals (76,098,000 bushels) in 1941 and an average of 42,350,000 centals (70,583,000 bushels) in the five preceding years; percentages, 93.9 and 101.2.

The quality of the tubers is not good, and this may influence their conservation.

SUGAR SEASON

After the publication of our first estimates on the production of beet sugar in Europe during the 1942-43 season, the "International Association for Sugar Statistics" has communicated the results of its October survey. On the basis of these new statistics, we have modified our estimates on production in Belgium and Sweden and added those of France, Serbia, Switzerland, and Turkey. All these recent estimates indicate that there has been a considerable decrease in the 1942-43 production as compared with 1941-42.

As regards Spain, we have left unchanged the estimate published in our last Bulletin, but the Secretary of the "General Association of Sugar Producers of Spain" has recently communicated that it is quite probable that the definitive figures be even lower than these contained in our table. An increase of 5 per cent. over last year is foreseen only in France; but production still remains remarkably lower than average.

Considering the total of the countries mentioned in the table, it may be seen that, compared with production last year and the average, the production of the season 1942-43 is by 10 per cent. lower. This does not naturally mean that the decrease has been general for the whole of Europe in the same measure, because the countries surveyed represent only 2/5 of European production (not including the U. S. S. R.), and in the remaining countries the sugar beet season has not always been so unfavourable.

As for cane sugar of the 1942-43 season, the number of official production estimates is very small; for the season 1941-42 there are a few more estimates available. For the time being at least, we have decided to stick, to the estimates published by F. O. Licht who has collected them, as he writes in the explanatory note preceding his table, " after considerable difficulties ".

Production of Beet-Sugar (raw).

COUNTRIES	TOTAL PRODUCTION DURING THE SEASON						% 1942-43	
	1942-43 (1)	1941-42	Average 1936-37 to 1940-41	1942-43 (1)	1941-42	Average 1936-37 to 1940-41	1941-42 = 100	Average = 100
	thousand centals			short tons				
Belgium	(2) 4,806	5,467	5,229	(2) 240,317	273,000	261,426	88	92
Bulgaria	882	1,235	613	40,000	62,000	30,670	71	144
Denmark	4,960	6,151	5,019	248,000	308,000	250,954	81	99
Spain	3,086	3,550	3,155	150,000	177,480	157,748	87	98
Finland	121	91	255	6,100	4,557	12,741	133	48
France	(2) 16,513	(2) 15,785	18,493	(2) 825,661	(2) 789,240	924,654	105	89
Italy	9,480	10,064	9,613	470,000	503,200	480,642	94	99
Romania	926	1,342	2,559	46,000	67,090	127,957	69	36
Serbia	(2) 392	(2) 640	—	(2) 19,596	(2) 32,003	—	61	—
Slovakia	1,213	1,494	(3) 1,299	61,000	74,710	(3) 64,929	81	93
Sweden	6,091	6,790	6,868	304,600	340,000	343,411	90	89
Switzerland	(2) 419	422	295	(2) 21,000	21,079	14,727	99	142
Turkey	(2) 1,268	2,110	1,676	(2) 63,400	105,518	83,785	60	76

(1) Approximate data. — (2) Data of the International Association for Sugar Statistics. — (3) Average of two years.

According to F. O. Licht, the production of cane sugar in the 1941-42 season in northern and central America was by 20 per cent higher than in 1940-41, thanks especially to the remarkable increases registered in Cuba, Louisiana, Florida, Puerto Rico, Trinidad, Barbados, Dominican Republic and Mexico. In South America the production of this season may be estimated about the same as last year, while in Oceania it is slightly lower. Sugar production in Africa is 10 per cent below last year, owing especially to the decrease registered in the Union of South Africa where, in the 1941-42 season, sugar production fell below 4/5 of the quantities obtained in 1940-41.

A reduction of 8 per cent has been registered in Asia, which may be attributed to the fact that at Java sugar canes have been replaced by cotton, and that production in India was lower than the year before.

Altogether, world production of cane sugar in 1941-42, according to first estimates, would be slightly higher than in 1940-41.

E. R.

EXTENSION FOR TWO YEARS OF THE INTERNATIONAL SUGAR AGREEMENT

The International Sugar Agreement, signed in London on May 6, 1937, and operating from September 1, 1937, was to remain in force for a period of five years, ending August 31, 1942. According to Article 50 (*b*) the Contracting Governments were to decide at least six months before the expiration of the Agreement whether it should be continued for a further period and, if so, on what terms. In the event of unanimity not being attained, the Governments which desired to maintain the Agreement should be entitled to do so as between themselves.

It was officially announced on September 8, 1942 by the International Sugar Council that a Protocol continuing the Agreement in force for two years from August 31, 1942, has been signed by representatives of the following Governments: South Africa, Australia, Belgium, Brazil, Cuba, Czechoslovakia, Dominican Republic, Haiti, Netherlands, Peru, Portugal, United Kingdom, Union of Soviet Socialist Republics, United States of America (and Commonwealth of the Philippines).

Thus out of 21 Governments originally subscribing to the Agreement, 14 or just two-thirds have decided to continue the Agreement for a further period. The abstaining one-third consists of China, France, Germany, Hungary, India, Poland and Yugoaslavia.

CURRENT INFORMATION ON SUGAR.

Denmark: According to press information, competent autorities admit that yields of the sugar beet crop this year were about 20 per cent lower than the year before, notwith standing the fact that the area to sugar beets was the same as in 1941. Owing to the long winter, sugar beets could be seeded only very late, so that their development was also late. Summer was very rainy. Excessive humidity affected the sugar content of the tubers. From an economic point of view, this regression causes some difficulties for Denmark, because an important surplus of sugar could have been traded for wood, paper and other products of Sweden, Norway or Finland.

It is yet impossible to estimate the importance of the result of this poor crop on these commercial exchanges.

Hungary: Towards October 20, pulling out and storing of sugar beets continued. Owing to dry soil, the work has proceeded with some difficulty. Roots are generally in good condition and sugar content is satisfactory.

Italy: The first deliveries showed that production would be satisfactory. In fact, although it was generally forecast that yields would not be very high, it was also apparent that this scarcity would be compensated by the high degree of polarisation which increased progressively during the whole month of August and until the tenth of September, especially in Romagna. At the end of August, the average degree of polarisation of sugar beets delivered to the factories adhering to the « Consortium » was

17,2 per cent against 16,6 per cent at the corresponding date the year before. At the end of September average polarisation was still 17 per cent, against 16,4 per cent the preceding season. This high percentage was obtained this year thanks to favourable weather conditions in August and September.

Deliveries will amount to the remarkable figure of to 77-79 million centals or 3,9-4.0 million tons.

By the end of September, 35 ont of 59 factories adhering to the « Consortium » had finished their work.

The plan of production prepared by the Ministry of Agriculture for the year 1943 foresees an increase of 15.000 acres to sugar beets, as compared with the year before.

United Kingdom: According to press information, in spite of a cold dry Spring which must have retarded germination, the sugar beet crop has made good progress during late months and a very good output of beet sugar is anticipated.

Serbia: In order to insure the sugar supply for the population, the Governement plan for the reorganisation of Serbian agriculture foresees an increase of the acreage to sugar beets in the year 1943, up to 40,000 acres. The Government has taken the following measures to insure the fulfilment of the plan: To begin with, the distribution of the areas to be sown to sugar beets must be done on a rational principle intended to economize on transportation charges; therefore the areas to sugar beets must be chosen, whenever possible, near sugar factories. The factories are obliged to make separate agreements with the farmers, or collective agreements with agricultural cooperatives for the delivery of sugar beets at the following conditions: (1) the factories must provide farmers with the necessary amount of seed at net cost; (2) the factories must lend the sowing machines, free of cost, to the farmers for the period of sowings; (3) the factories must advance farmers 2.000 dinars in cash and 30 kg. (66 lb.) of sugar at the time of the first weeding of the sugar beet crop under condition that this advance will be reimbursed with legal interests and that the sugar will be paid at market prices at the moment of the delivery of sugar beets to the factories.

Sweden: The 1942 sugar beet production is estimated at 40,080,000 centals (2,004,000 sh. tons) against 40,646,000 centals (2,032,000 sh. tons) in 1941 and an average of 41,753,000 centals (2,088,000 sh. tons) in the five preceding years: percentages: 98.6 and 96.0.

According to official information which appeared in the press at the end of October, 50 per cent of the production of sugar beets could be stored. The apprehensions of competent authorities that the crop could not be stored on time resulted unjustified, because it was possible to assemble a sufficient number of labour hands to store also the other part of the crop before Winter. The employment of soldiers, students and labourers in the regions where the gathering of the crop has been completed, will make it possible to be over with the work very shortly.

Ukraine: According to press reports, the sugar content of sugar beets is very high, thanks to a dry and sunny Autumn. In fact it generally amounts to 16 per cent., but in some cases it goes up even to 18 per cent.

Jamaica: According to the « West India Committee Circular » the 1942 sugar crop will total about 3,494,000 centals (174,700 sh. tons) as against preliminary estimates of 3,763,000 centals (188,200 sh. tons). Low succose in canes, oving to rains during the grinding season, is responsible in great measure for the reduction, while transport difficulties, due to petrol rationing, have also played their part, and a good deal of stale cane was ground to help the farmers that in normal times would doubtless have been rejected.

The estimated production above indicated gives the percentages of 99.8 and 146.2 against 3,500,000 centals (175,000 sh. tons) in 1940/41 and 2,390,000 centals (119,500 sh. tons) in the average 1935/36 to 1939/40.

Taiwan: The production of cane-sugar in 1942-43 is estimated at 23,466,000 centals (1,173,000 sh. tons) against 24,868,000 (1,243,000) in 1941-42 and an average of 24,388,000 (1,219,000) in 1936-37 to 1940-41; percentages, 94.0 and 96.0.

Manchukuo: Sugar beet production this year has been about the same as last year, but sugar content is higher.

VINTAGE RESULTS IN 1942.

In the Crop Report of last month the European production of wine was estimated at 3.080 million gallons (3.689 million A. gall.) and world production at 3.850 million gallons (4.623 million Am. gall.). These estimates were based on a French production of 1.100 million gallons (1.321 million Am. gall.) according to a forecast at the end of October. But more recent information now puts this production at about 770 million gallons (925 million Am. gall.). The forecast for the European wine production must therefore be reduced to 2.750 million gallons (3.302 million Am. gall.), and world production to 3.520 million gallons (4.227 million Am. gall.). These figures are slightly lower than those of last year.

CURRENT INFORMATION ON VINES.

Bulgaria: According to some unofficial estimate area cultivated to vines is 408,000 acres, against 346,000 in 1941 and 297,000 on the average of the preceding 5-year period; percentages: 117.7 ans 137.1. The corresponding grape production is estimated at about 11,023,000 centals against 7,864.000 and 9,929.000; percentages: 140.2 and 111.0.

The corresponding wine production is estimated at about 39,596,000 Imperial gallons (47,551,000 Amer. gallons) against 33,714,000 (40,487,000) and 36,254,000 (43,538,000); percentages: 117.4 and 109.2.

Spain: Estimates for a good wine production are confirmed. The quality of the wine appears also above average.

France: According to very recent information, it is estimated that France, in the season 1942-43, will only dispose of a national wine production of about 770 million gallons (925 million Am. gall.), instead of 1.100 million gallons (1.321 million Am. gallons) forecast at the end of last October. One of the chief causes of this poor production must be found in the scarcity of treatments with copper sulphate.

Hungary: Towards October 20, vintage was over nearly everywhere in the country. Wine production is average as to quantity and above average as to quality. In some places, the quality of the wine is very good.

Serbia: The Government plan for the reorganisation of Serbian agriculture has fixed at about 150,000 acres the area to be devoted to the planting of vineyards in 1943.

Romania: After two poor crops in succession, wine production in Romania in 1942 has been comparatively abundant and has come near normal. According to competent unofficial sources, wine production is estimated at from 110 to 132 million Imp. gallons or 132 to 159 million Am. gallons. These figures refer to the present territory of Romania (including Bessarabia and Bukovina), without Transnistria. In the five years 1935-1939, wine production in Romania within its pre-war frontiers, varied from 147 to 177 million Imp. gallons (253 to 304 million Am. gall.) Owing to the sharp increase of the prices of production, the Government has taken the necessary measures to prevent bending of the prices of wine, which woud occasion heavy losses to producers. A credit of 100 million lei has been put at the disposal of wine producers to prevent their selling their production at low prices. It is foreseen that an important quantity of Romanian wine will be exported to Germany.

Slovakia: According to unofficial information, the area to vineyards this year amounts to 17,000 acres. The production of wine has amounted to 3,320,000 Imp. gall. (4,160,000 Am. gall.), against 1,716,000 Imp. gall. (2,028,000 Am. gall.) in 1941 which was a very poor year for wine. The quantity of wine produced this year must be considered slightly above average, while the quality of grapes is very good and their sugar content very high.

CURRENT INFORMATION ON OLIVES.

Spain: It is estimated that the olive crop this year will be 30 per cent below that of the year 1941-42.

Switzerland: According to press information, the war office for the supply of food has enacted new regulations concerning the extraction of edible oil from grape-stones.

Tunis: Forecasts on olive oil production in the season 1942-43 are excellent.

CURRENT INFORMATION ON FLAX.

Finland: Acreage sown to flax and hemp in 1942 is estimated at 9,400 acres against 7,900 in 1941. Percentage: 118.7.

Argentina: According to the fourth estimate wired by the Argentine Ministry of Agriculture to the Institute on November 21, the area sown on flax in 1942-43 amounts to 6,128,000 acres, against 6,746,000 in 1941-42 and 7,354,000 as an average for the five preceding years. Percentages: 90.8 and 83.3. The sharp decrease registered this year must be attributed to the existence in the country of heavy unsold stocks from the last two seasons.

(Telegram of December 2): The condition of the flax crop is good all over the country.

Canada: The area cultivated to linseed is estimated this year at about 2,433,000 acres, againgst 958,000 in 1941 and 327,000 on the average during the period 1936-40; percentages: 254 and 745. The corresponding production amounts to 8,395,000 centals (14,991,000 bushels) against 3;625,000 (6,473,000) and 1,013,000 (1,809,000); percentages: 232 and 828.

CURRENT INFORMATION ON COTTON.

Argentina: According to an official communication of the Argentine government, the area cultivated to cotton in 1941-42 is estimated now at 815,500 acres, comparde with 831,800 last year and 976,000 on the average in the preceding 5 years; percentages: 98.0 and 83.5. The corresponding production amounts to 371,300 bales of 478 lb. net weight, against 232,200 and 288,800; percentages: 159.9 and 128.6.

United States: According to the November Cotton Report, production is estimated at 13,328,000 bales of 478 lb. net weight (13,818,000 bales according to the October estimate), compared with 10,744,000 bales actually produced in 1941, and 13,534,000 bales on the average during the 5-year period 1936-40; percentages: 124.1 and 98.5. Yield of cotton lint per harvested acre is estimated now at 274.9 lb. (285.0 last month) against 231.9 the final estimate of 1941 and 215.0 on the average during the 10 years 1931 to 1940; percentages: 118.5 and 127.8. The amount of cotton ginned up to November 1, 1942, is officially estimated at 9,726,000 running bales, counting round bales as half bales and exclusive of linters. In proportion to the indicated production this year, this amount is normal for November 1, in spite of the fact that exports are virtually inexistent, and this is a consequence of the exceptionnally high home consumption of cotton.

CURRENT INFORMATION ON HEMP.

Italy: According to the production plan prepared by the Ministry of Agriculture, it is foreseen that the acreage to hemp in the 1942 season will be 1,190 acres smaller than that of the preceding season.

Serbia: In order to limit as far as possible the importation of textile fibers, the Government plan for the reorganisation of Serbian agriculture, has fixed at 47,000 acres the acreage to be sown to hemp and flax.

CURRENT INFORMATION ON TOBACCO.

Bulgaria: According to press information and to data furnished by the Ministry of Agriculture, the production of tobacco in 1942 is estimated at about 136,690,000 lb. This figure is about the same as that of 1941.

In order to encourage the increase of the production, the Ministry of Agriculture has opened a credit of 300,000 Lewa in favour of the Institute of Studies for the improvement of Tobacco.

Hungary: Towards October 20, tobacco harvesting was over. Dry weather favoured storing and drying of the crop.

Italy: According to the production plan prepared by the Ministry of Agriculture, the area to tobacco in 1943 should be increased by 1,110 acres over last year.

Serbia: In order to meet the growing demand for tobacco, the Government plan for the reorganisation of Serbian agriculture has fixed at 22,600 acres the area to be sown to this crop in the year 1942-43. The distribution of the land to be devoted to tobacco growing in the different districts and departments will be prepared by the Ministry of Agriculture and Supplies in agreement with the Direction of Tobacco Monopoly.

Ukraine: According to press reports, the area sown to tobacco this year amounts to 148,000 acres.

Turkey: According to press information, based on the condition of the tobacco crop at the end of September 1942, it is possible to get a general idea about tobacco production this year. In the region of Izmir, which is the most important tobacco raising section of the country, production is estimated at 77,162,000 lb., against 61,730,000 lb. in 1941. In the tobacco producing region along the litoral of the Black Sea, the 1942 production amounts to 20,944,000 lb, against 14,330,000 lb. in 1941. In the third tobacco producing region, namely the province of Taçova, and particularly in the districts of Erbaa, Niksar an Tokat, the 1942 production is estimated at 8,378,000 lb., against 6,614,000 lb. in 1941. As regards the region along the Sea of Marmara, it is estimated that tobacco production amounts to 25,353,000 lb.

CURRENT INFORMATION ON OTHER PRODUCTS.

Colza and sesame.

Hungary: Owing to the drought, sowings of winter colza were done with difficulty. In many places, seeds have not sprouted or have done so defectively

Mustard.

Sweden: According to press reports, up to the present date only 40 per cent. of the quantities of mustard seeds that should have been delivered by contract, have actually been turned in. It seems that the yields obtained this year from the 30,000 acres sown to white mustard were not what had been expected, both as to quantity and quality. Water contents of the seeds is very high and is nearly always from 15 to 33 per cent. Farmers that deliver mustard seed containing over 15 per cent of water are subject to a reduction of price. Nearly all farmers are in this condition. Producers, therefore, consider the crop a bad one.

Soya.

Serbia: According to the Government plan of reorganisation of Serbian agriculture, the acreage to be sown to soya in 1943 will be increased to 20,000 acres, which means that it will be about four times larger than the whole area sown to this crop in former Yugoslavia.

Sunflower.

Hungary: Dry weather has favoured the storing and threshing of sunflower. Owing to the drought, yields are lower than had been estimated.

Serbia: In order to make up for the deficiency of fats needed both for human alimentation and for industrial purposes, the plan of the Government for the reorganization of Serbian agriculture includes a considerable increase of the acreage to oleaginous crops. According to this plan, the area that should be sown to sunflower in the Spring 1943, should amount to 77,000 acres as a principal crop, and 18,500 acres as an intermediary culture along with other crops. Owing to this increase the acreage to sunflower will be almost as high as the total area sown to this crop in former Yugoslavia.

Jute.

India: According to the final estimate jute production amounts to 36,057,000 centals (9,014,130 bales of 400 lb.) against 21,690,000 (5,422,500) in 1941 and 37,926,000 (9,481,400) on the average during the five-year period 1936-40; percentages: 166.2 and

95.1 The available quantity, *i. e.* this year's production and the carry-over of last year, amounts now to about 51,760,000 centals (12,940,000 bales of 400 lb.) compared to 48,800,000 (12,200,000) last year. Jute consumption in India will probably amount, during the present season, to 22,000,000 centals (5,500,000 bales) and exports to 6,000,000 (1,500,000) leaving a carry-over at the end of the season of more than 23,600,000 centals (5,900,000 bales).

CURRENT INFORMATION ON FODDER CROPS.

Finland: Hay production of artificial meadows in 1942 is estimated at 53,021,000 centals (2,651,000 sh. tons) against 44,049,000 centals (2,202,000 sh. tons) in 1941. Percentage: 120.4. Corresponding figures for hay production of natural meadows are 4,828,000 centals (241,400 sh. tons); 3,924,000 centals (196,200 sh. tons); 123.0 per cent.

Hungary: Towards October 20, forage beets were being harvested and stored. The drought made the pulling out of tubers rather difficult. Tubers are generally in good condition. Late meslin has been harvested. Owing to the drought, straw is short and the production of seeds very weak. The seed production of buckwheat and sorghum was unsatisfactory and below average. The vegetation of clover and lucerne had already ceased in August; therefore the total production of these two crops is under average, and so is their seed production. Owing to the summer drought, clover and lucerne sown in the Spring could not develop sufficiently. Still owing to the drought, the customary Autumn sowings of clover and lucerne could not be done this year everywhere. During the third decade of October, natural meadows and pastures could not furnish enough nourishment to livestock, which had to be fed in the stables.

Serbia: In order to encourage the development of forage crops in a country which is poor in meadows and pastures, the Serbian Government has taken the following measures: (1) the reduction of areas to the most important fodder crops (lucerne, red clover, fodder beets) is forbidden in all agricultural holdings; (2) all agricultural holdings that this year cultivate over 3 ha. (7 acres) and which do not include fodder crops, must devote at least 10 ares to the cultivation of lucerne and red clover; (3) all agricultural holdings that this year have grown lucerne and red clover must devote at least ¼ of their areas to fodder seedings during the second mowing. The acreage to be sown to fodder crops in the year 1942-43 according to the Government plan of reorganisation of Serbian agriculture, has been fixed at 188,000 acres, of which 12,000 acres to sugar beets.

Sweden: The 1942 production of hay of artificial meadows is estimated at 82,036,000 centals (4,102,000 sh. tons) against 46,739,000 centals (2,337,000 sh. tons) in 1941 and an average of 103,734,000 centals (5,187,000 sh. tons) in the five preceding years. Percentages: 175.5 and 79.1.

The production of forage roots and tubercules in 1942 amounted to 54,432,000 centals (2,722,000 sh. tons), against 49,743,000 centals (2,487,000 sh. tons), in 1941 and an average of 58,907,000 centals (2,945,000 sh. tons) in the five preceding years. Percentages 109.4 and 92.4.

The prohibition to feed potatoes to pigs carries with it increasing difficulties in the matter of getting feeds for pig raising.

Argentina: The condition of pastures in October was average.

LIVESTOCK AND DERIVATIVES

PIGS IN DENMARK *).

(Thousand head)

Classification	1942 Oct. 3.	1942 Aug. 22	1942 July 11	1942 June 13	1942 May 2	1942 March 21	1942 Feb. 7	1941 Dec. 27	1941 Nov. 15	1941 Oct. 4
Boars for breeding	9	8	9	8	8	8	8	9	9	10
Sows in farrow for first time	55	56	61	48	37	27	20	23	28	44
Other sows in farrow	66	64	64	63	61	60	67	69	68	79
Sows in milk	44	40	30	31	32	30	34	42	50	59
Sows not yet covered (and not for slaughter)	20	16	13	14	13	19	20	22	27	24
Sows for slaughter	9	5	4	5	5	9	11	16	21	18
Total sows	*194*	*181*	*172*	*161*	*148*	*145*	*152*	*172*	*194*	*224*
Sucking pigs not weaned	377	337	253	251	256	229	246	326	398	494
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg.	326	280	286	283	270	329	409	513	534	524
Pigs of 35 and under 60 kg.	293	305	295	257	276	327	387	424	416	401
Fat pigs of 60 kg. and over	394	272	191	194	204	229	266	247	374	360
Total pigs	*1,593*	*1,383*	*1,206*	*1,154*	*1,162*	*1,267*	*1,468*	*1,691*	*1.925*	*2,013*

*) Rural districts only.

THE NUMBER OF SHEEP IN UKRAINE.

According to press information the number of sheep in Ukraine this year amounts to about 1 million head against 4,7 millions in 1941.

TRADE

PORTUGAL

Products and Units	August				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1942	1941	1942	1941	1941-42 1942 or 1942-43	1940-41 1941 or 1941-42	1941-42 1942 or 1942-43	1940-41 1941 or 1941-42	1940-41 1941 or 1941-42	1940-41 1941 or 1941-42
Wheat: 1,000 centals	0	0	261	856	0	0	261	856	0	3,117
» : Thous. bush. of 60 lb.	0	0	436	1,427	0	0	436	1,427	0	5,195
Wheat flour: 1,000 centals	0	0	0	2	0	0	0	2	4	10
Wheat flour: Thous. bbl. of 196 lb. . .	0	0	0	1	0	0	0	1	2	5
Maize: 1,000 centals.	0	0	31	291	0	9	1,047	1,525	9	1,742
» : Thous. bush. of 56 lb.	0	0	56	519	0	17	1,870	2,724	17	3,111
Rice: 1,000 centals .	0	0	0	8	0	38	9	47	38	86
» : Thous. bush. of 45 lb.	0	0	0	19	0	84	21	104	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	11	0	11
» : Thous. bush. of 56 lb.	0	0	0	0	0	0	0	19	0	19
Cotton: 1,000 centals	0	0	22	38	0	0	22	38	0	586
» : Thous. bales of 478 lb.	0	0	5	8	0	0	5	8	0	123
Wool: 1,000 lb. . .	0	0	11	9	0	0	884	207	—	—
Butter: » » . .	0	53	0	0	183	216	0	0	313	0
Cheese: » » . .	29	35	0	0	238	236	0	37	317	37
Cacao: » » . .	0	0	340	126	4	84	1,400	1,883	119	2,597
Tea: » » . .	—	—	2	33	—	—	13	77	—	379
Coffee: » » . .	0	108	584	150	2	205	606	500	284	9,094

SWEDEN: Imports.

Products and Units	September		Total from the beginning of the season *)		Total of the season *)
	1942	1941	1942	1941	1941-42
Wheat. 1,000 centals	3	0	426	0	781
» Thous. bush. of 60 lb.	5	0	711	0	1,302
Rye . . . . 1,000 centals	4	0	8	0	286
» Thous. bush. of 56 lb.	7	0	14	0	511
Oats . . . . 1,000 centals	0	32	33	33	163
» Thous. bush. of 32 lb.	0	101	103	103	511

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao; November 1st for maize.

ARGENTINA: Exports.

Products and Units		January 1-October 31	
		1942	1941
Wool: unwashed	1,000 lb.	249,123	249,725
Wool: washed	» »	56,659	50,019
Butter	» »	26,456	27,503

URUGUAY: Exports.

Products and Units		January	
		1942	1941
Wheat:	1,000 centals	—	—
» :	Thous. bush. of 60 lb.	—	—
Rice:	1,000 centals	—	11
» :	Thous. bush. of 45 lb.	—	24
Linseed:	1,000 centals	—	31
» :	Thous. bush. of 56 lb.	—	56
Wool (1)	1,000 lb.	5,569	15,769

(1) Wool exports during the seven months October 1, 1941 to May 30, 1942 amounted to 47,499 thousand lb. against 121,513 thousand lb. in the same period 1940-1941.

PORTUGUESE GUINEA.

Products and Units		May		Total from the beginning of the season *)		Total of the season *)
		1942	1941	1942 or 1941-42	1941 or 1940-41	1941 or 1940-41
Imports.						
Wheat flour	1,000 centals	1	0	2	1	2
» »	Thous. bbl. of 196 lb.	0	0	1	0	1
Butter	1,000 lb.	0	0	11	13	24
Cheese	» »	0	2	0	7	15
Exports.						
Rice	1,000 centals	0	28	6	60	115
»	Thous. bush. of 45 lb.	0	61	14	132	256

*) See note page 403.

ANGOLA.

Products and Units	February 1942	February 1941	Total from the beginning of the season *) 1942 or 1941-42	Total from the beginning of the season *) 1941 or 1940-41	Total of the season *) 1941 or 1940-41
Imports.					
Butter . . . . . 1,000 lb.	9	0	15	2	44
Cheese . . . . . » »	7	2	9	9	68
Exports.					
Maize . . . . . 1,000 centals	414	600	1,270	1,232	3,647
» . . . . . Thous. bush. of 56 lb.	739	1,072	2,267	2,200	6,513
Rice . . . . . 1,000 centals	4	1	9	2	46
» . . . . . Thous. bush. of 45 lb.	8	2	21	3	102
Coffee . . . . . 1,000 lb.	586	51	22,093	6,638	17,174

*) See note page 403.

PRICES BY PRODUCTS. — Quotations for future delivery.

Description	Nov. 13, 1942	Nov. 6, 1942	Oct. 30, 1942	Oct. 23, 1942	Monthly averages: Oct. 1942	Nov. 1941	Nov. 1940	Nov. 1939	Nov. 1938
Wheat.									
Winnipeg (cents p. 60 lb.):									
delivery October	—	—	90	90	90	—	—	1) 70 1/8	1) 57 7/8
" December	90 3/8	90 1/8	90 5/8	90 3/4	90 3/4	73 5/8	72 1/4	70 1/8	58 1/8
" May	—	—	—	—	—	77 1/4	76 1/8	75 1/4	61 3/8
" July	—	—	—	—	—	78 5/8	78 1/8	76 1/8	62 1/8
Chicago (cents. p. 60 lb):									
delivery December	125 1/8	126 1/4	124 1/4	124 1/8	125 1/8	114 7/8	87 1/8	87 3/4	63 3/8
" May	128	128 1/8	126	126 1/8	127 5/8	120 1/4	86 5/8	86	65 3/4
" July	128 3/8	128 7/8	125 7/8	126 7/8	128 1/8	120 7/8	82 3/8	84	65 5/8
Rye.									
Winnipeg (cents p. 56 lb.):									
delivery October	—	—	54 3/8	56 1/4	58 3/8	—	—	—	—
" December	57 1/8	56 1/8	55	56 7/8	56 7/8	58 3/8	46 3/8	57 1/8	38 3/4
" May	60	59 1/4	57 1/4	58 5/8	59	61 1/8	49 3/8	60 1/2	40 7/8
" July	—	—	—	—	—	62	—	59 7/8	—
Chicago (cents p. 56 lb.):									
delivery December	61 3/4	62	61 3/4	66 1/8	66 1/8	65	44 7/8	53 1/4	41 5/8
" May	67 5/8	68	67 3/4	72	72 3/8	71 1/8	49 1/4	54 1/2	44 3/8
" July	69 3/4	70 1/4	69 5/8	73 7/8	74 1/4	73 1/4	50 1/4	54 5/8	45
Barley.									
Winnipeg (cents p. 48 lb.):									
delivery October	—	—	60	60 1/8	60 5/8	—	—	—	—
" December	60 1/4	60 1/8	60 1/8	60 1/4	60 3/8	57 1/8	43 3/4	43 1/8	34 5/8
" May	63 1/8	63 1/4	62 1/4	60 3/4	61 3/8	58 1/8	42 7/8	45 1/4	35 5/8
" July	—	—	—	—	—	57 5/8 *	41 7/8	45 3/8	—
Oats.									
Winnipeg (cents p. 34 lb.):									
delivery October	—	—	45 1/8	46 5/8	46 3/4	—	—	—	—
" December	45 1/8	45 5/8	45 1/4	45 1/4	45 3/4	44 1/4	32 7/8	32 5/8	27 1/8
" May	47 7/8	48	46 3/8	45 3/4	46 1/8	45 1/8	32 1/8	34 1/8	28
" July	—	—	—	—	—	* 44 1/8	31	34	* 27 7/8
Chicago (cents p. 32 lb.):									
delivery December	50	50 7/8	48 1/8	48	49 1/8	49 3/4	37 3/8	37 1/2	25 1/8
" May	53 3/4	53 3/8	51	51	51 5/8	52 5/8	36	35 7/8	26 1/8
" July	52 1/8	53 1/4	51 1/8	51 5/8	51 5/8	51 1/4	32 3/4	32 3/8	26 1/4
Maize.									
Chicago (cents p. 56 lb.):									
delivery December	83 7/8	82 3/4	79 1/8	80 3/4	81 3/8	75 1/8	62 1/2	51	47
" May	88	88 1/8	84 3/8	85 3/8	86 1/4	81 1/8	62 3/4	53	50 3/4
" July	89 7/8	89 3/4	85 7/8	87 1/8	87 7/8	82 7/8	62 7/8	53 1/8	51 3/4
Linseed.									
Winnipeg (cents per 56 lb.):									
delivery October	—	—	164	164	164	—	—	1) 157 5/8	1) 135 1/8
" December	164	164	—	—	—	150 3/4	130 3/8	157 5/8	135
" May	—	—	—	—	—	153 1/4	134 7/8	160 3/4	134 1/8

* Indicates that the product was not quoted during part of the period under review. — (1) Novembe Delivery.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS

*The following explanations refer to crop conditions quoted in the crop notes and in the tables. — Crop condition according to the system of the country : **Germany, Bohemia and Moravia (Protectorate); Hungary :** 1 = excellent, 2 = good, 3 = average, 4 = poor, 5 = very poor; **Finland :** 8 = very good, 6 = above the average, 5 = average; **France :** 100 = excellent, 70 = good, 60 = fairly good, 50 = average, 30 = poor; **Romania and Sweden :** 5 = excellent, 4 = good, 3 = average, 2 = poor, 1 = very poor; **Netherlands :** 90 = excellent, 70 = good, 60 = fairly good, 50 = below awerage; **Portugal :** 100 = excellent, 80 = good, 60 = average, 40 = poor, 20 = very poor; **Switzerland :** 100 = excellent, 90 = very good, 75 = good, 60 = fairly good, 50 = average, 40 = rather poor, 30 = poor, 10 = very poor: **U. S. S. R. :** 5 = good, 4 = above the average, 3 = average, 2 = below average, 1 = poor; **Canada :** 100 = crop condition promising a yield equivalent to the average yield of a long series of years; **United States :** 100 = crop condition which promises a normal yield; **Egypt :** 100 = crop condition which promises a yield equal to the average yield of the last five years. — For other countries the system of the Institute is employed : 100 = crop condition which promises a vield equal to the average of the last ten years.*

NOTE: *The countries are listed throughout by continents (Europe, followed by the U. S. S. R., America, Asia, Africa and Oceania) in the French alphabetical order. In the tables the Northern Hemisphere precedes the Southern Hemisphere.*

VEGETAL PRODUCTION

OLEAGINEOUS CROPS IN EUROPE AND ATTEMPTS AT THEIR DEVELOPMENT (*continuation*)

by IVAN GRINENCO

The following pages contain the last part of the paper on the situation of the vegetal oils supply of Europe (not including the U. S. S. R.) up to the eve of the present world war, and on the efforts made by the countries of this continent to develop their oleagineous crops, after the breaking of the war and as a consequence of the circumstances created by it.

The information contained herein, completes our survey (see the September and November issues of this Crop Report) with a summary of the material available for the countries of South-Eastern Europe, and it is followed by some general conclusions.

II.

Government measures to increase the production of oleagineous crops in various countries.

Countries of South-Eastern Europe.

The changes brought about by the present war in the territorial composition of all the countries of South-Eastern Europe are so great that in most cases a comparison between pre-war and present-day statistics is well nigh impossible. Moreover, data for recent years are mostly fragmentary and incomplete.

Considering however that in most of the countries of this part of the continent the cultivation of herbaceous oil-giving plants had more or less been expanded many years back, a retrospective survey may be useful to give a correct idea of the results obtained during that period.

In *Albania*, the area under herbaceous oil-giving plants in 1938 was only 645 acres, of which 457 under cotton and 124 under castor-oil. No figures are available for the following years. But it is known that the Government took some measures for an increase of these crops, particularly cotton.

In former *Yugoslavia*, on the eve of the present world war, herbaceous oil-giving crops during the three years 1937-1939 covered an average of about 306,400 acres, viz. 1,6 per cent. of the country's arable lands, distributed as follows:

Crops	Area (acres)			Production (metric tons)		
	1937	1938	1939	1937	1938	1939
Hempseed	139,125	142,918	144,966	4,490	2,990	3,110
Linseed	33,644	35,475	36,266	1,330	1,360	1,510
Cottonseed	7,636	13,544	13,939	1,500	2,870	2,370
Colza and rape-seed	46,852	47,072	37,635	8,240	8,960	7,810
Poppy-seed	22,534	19,994	22,077	2,960	1,760	2,340
Castor-oil	1,747	1,045	813	870	480	270
Sesame	3,971	3,899	4,344	350	480	530
Soya	3,079	9,529	8,417	1,460	3,810	2,800
Sunflower	23,856	47,952	48,475	17,100	28,830	27,290

The relative importance of the production (expressed in terms of oil) of the different crops under survey, differs considerably from that of the acreages covered by them. Thus, hemp and linseed, which were grown over one half of the total area under herbaceous oil-giving crops (about 178,000 acres as an average in the three years 1937 to 1939), yielded only 10 per cent. of the total production expressed in terms of oil. As these crops are raised chiefly for the production of fibre their yields in seeds are actually very low (hemp 54 lb. per acre and linseed 89 lb. per acre). During the twenty years before the war, the area under linseed remained practically unchanged, while that under hemp increased heavily, especially since 1934. The same increasing tendency was shown by cotton, poppy-seed and sesame.

The increase of area to colza, rape-seed, soya and especially sunflower which, with soya began to spread in the country only in 1934, was particularly important. Castor-oil, which in 1937 had been grown over a maximum area of 1,740 acres in 1939 covered only 810 acres.

In the three years 1937 to 1939, sunflower yielded 1,338 lb. per acre, castor-oil 1,044 lb., soya 848 lb. cottonseed 428 lb., colza and rape-seed 419 lb. and sesame 250 lb. Poppy-seed, which is grown chiefly for the production of opium, yielded only 241 lb. per acre.

The statistics for the years 1940 and 1941 come from unofficial sources and are incomplete; but however they show that in former Yugoslavia the tendency

to increase the acreage to herbaceous oil-giving plants, especially sunflower and soya, had strengthened even more. The area under sunflower had reached 79,800 acres in 1940 and 185,300 acres in 1941. A contribution to this development was brought about by the premium of 40 dinars per acre granted in 1941 to farmers that raised sunflower on fallow land. The area under soya seems to have increased from 30,000 acres in 1940 to 42,000 in 1941. Among other products that can yield vegetal oils figure the sprouts of maize, tobacco seeds, gourd seeds, and grape-stones. No sure indication is available concerning the measure in which these products are made use of for this purpose.

Besides raising these herbaceous oleagineous plants, former Yugoslavia, in the five years 1935 to 1939, produced also an average of 4,800 metric tons of olive oil.

The dismemberment of Yugoslavia led to the creation of Croatia, Serbia and the Banat, while the rest of the former Yugoslav territory was annexed by Albania, Italy, Germany, Bulgaria and Hungary.

Croatia, which obtained about 39 per cent. of the arable land of former Yugoslavia, in the three years 1937 to 1939, raised herbaceous oil-giving crops over about 99,000 acres that is 1,3 per cent. of its arable land distributed in the following manner:

Crops	Area (acres)	Production (metric tons)
Hempseed	35.715	...
Linseed	24,802	...
Colza and rape-seed	26,068	3,900
Poppy-seed	736	...
Sunflower	8,466	4,610
Soya	3,981	1,566

About one third of the total area destined to herbaceous oil-giving crops in former Yugoslavia is within the territory of Croatia: the proportion according to each crop, however, is quite different: 70 per cent. for linseed, 60 per cent. for colza and rape-seed, 57 per cent. for soya, 25 per cent. for hemp, 21 per cent. for sunflower, and only 3 per cent. for poppy-seed. Over one fourth of the production of oil of former Yugoslavia was obtained in the territory of Croatia.

Statistics of more recent years are fragmentary. According to private information, the production of linseed in 1941 obtained on an area of 22,000 acres amounted to about 1,000 metric tons, viz., to about 70 per cent. of the production of former Yugoslavia. It seems however that a very considerable increase was registered in the production of sunflower which in 1941 reached about 10,000 metric tons, that is almost the double as compared with the average for the three years 1937 to 1939. Taking for granted during these three years an average yield of 1,150 lb. per acre, the area under sunflower in 1941 must have amounted to about 17,300 acres, while (always according to unofficial sources) it increased to nearly 42,000 acres in 1942. The area under soya was estimated at 18,313 acres in 1941, against 12,659 in 1940, with a production of about 7,500 metric

tons. For the year 1942 a further increase of the area under soya had been planned by the Ministry of Agriculture, which not only had carried on a widespread publicity, but had also distributed about 700 metric tons of seeds to farmers. According to official statements one of the great obstacles to the rapid increase of soya growing in Croatia, was represented by the comparatively low price of this product, which in 1941 had been hardly 22 per cent. above that of wheat.

Beginning from October 1941, the purchase price of oleagineous seeds, in Kunas per 100 kg. was fixed as follows: sunflower 500, soya 550, gourd seeds 650 (the production of gourd seeds in recent years varied from 3,000 to 5,000 metric tons a year), hempseeds 750, and linseed and castor-oil 1.000. Prices of the 1942 crops went up considerably: 800 Kunas for sunflower, 900 for soya, 1,000 for gourd and colza, and 1,250 for hemp and linseed. It may be noted that during the same season, the prices of wheat (77 kg. and over per hectoliter and 1 per cent. impurity) were fixed by the Ministry of Commerce at 450 Kunas per 100 kg. to which a prompt delivery premium of 150 Kunas per 100 kg. was added for all amounts delivered before September 30, 1942.

The territories of *Serbia* and the *Banat* cover about 22 per cent. of the territorial area of former Yugoslavia and include about 26 per cent. (7,310,700 acres in Serbia and 2,101,900 acres in the Banat) of the Yugoslav agricultural land. The proportion of the areas under oleagineous crops in these territories in the pre-war period is not known.

The interest in the spreading of these crops in Serbia is revealed by the fact that already in 1941, in Belgrade, an Association of Serbian Producers of Oleagineous Seeds was created, which may be considered as a continuation of the activities of the Yugoslav Association, created for the same purposes in 1935 The new Association, for the time being, has concentrated its activity mostly on soya and sunflower.

While for the years 1941 and 1942 statistics were only uncertain and fragmentary, some precise elements which make an estimate possible on the present situation of the principal oleagineous plants whose cultivation is obligatory, are furnished by the Serbian Government plan for the distribution of crops in 1942-43. This plan allows to sunflower only 76,600 acres and 18,500 acres to sunflower (mixed crop with the maize) 47,000 acres to linseed and hempseed together and 19,800 acres to soya. These data may be completed by adding that in 1942, according to unofficial information, colza growing covered 37,100 acres and linseed 12,400 acres.

While encouraging the increase of the production of oleagineous seeds, the Government pushed also the plans for the creation of new oil factories for oil extraction within the country itself. They also recommended a larger utilisation of other products, such as maize sprouts, grape-stones, tobacco and gourd seeds, etc. It is worth remarking that for the gathering of gourd seeds which is generally difficult and expensive, Serbian school pupils have been employed. They receive a cash compensation that is proportionate to the quantity of seeds brought to the school which acts as a gathering center. They are interested therefore in making their seed deliveries carefully and systematically.

As regards prices, all we know is that in October 1942 sunflower seeds were paid 513 dinars per 100 kg. to the producer, who had also a right to two litres of oil and 15 kg. of oil cakes, which represent a value of 110 and 42 dinars respectively. Thus the price actually paid to the producer is 665 dinars. Wheat, in 1942, was paid 400 dinars per 100 kg.

Statistics relative to the *Banat* which at times is considered as part of Serbia and at other times as a unit in itself, are uncertain and fragmentary. According to press information, the 1942 sunflower seed production in the *Banat* amounted to about 10,000 metric tons.

In spite of the gaps in the statistics of Croatia, Serbia and the Banat, it may be safely stated that in the last two years, oleagineous crops in these countries (especially sunflower, soya and, in a lesser degree, also colza and rape-seed) increased considerably. Probably the areas now under these crops in these territories are larger than those under the same crops in former Yugoslavia. When it is considered that Croatia, Serbia and the Banat together include only two thirds of the agricultural land of Yugoslavia, and that in the Yugoslav districts annexed to Germany, Italy, Albania, Hungary and Bulgaria there has been also a considerable increase of oleagineous crops the importance of this increase compared with conditions in former Yugoslavia appears strikingly evident.

The condition of herbaceous oil-giving crops in *Bulgaria* during the latest years and in comparison with the pre-war period, is shown by the following table:

Crops	Area (acres)					Production (metric tons)				
	1938	1939	1940	1941	1942	1938	1939	1940	1941	1942
Cottonseed	135,949	117,322	123,554	148,265	172,976	15,000	15,700	11.900	...	...
Hempseed	24,753	23,124	27,182	34,101	...	2,200	3,000	5.000	...	...
Linseed	7,957	9,380	12,355	19,769	...	800	...	...	...	...
Groundnuts	6,316	...	...	...	...	1.500	...	...	...	...
Colza	53,734	57.846	...	...	...	20.600	30.800	8.400	...	...
Poppy-seed	2,244	...	...	...	...	300	...	...	...	...
Sesame	4.048	...	...	...	...	200	...	...	...	...
Soya	30,557	44,480	74,133	98,844	172,976	6,700	17,000	28,500	...	35,000
Sunflower	468,123	364,466	365,721	494,218	...	117,500	190,600	190,000	...	...
Castor-oil	840	534	8,063	19,136	...	314	253	4,365	10,000	...

It must not be forgotten that data for the years 1938 and 1939 are referring to conditions in the pre-war territory, and those of 1940 and following years to the territory increased by the annexation of the districts that belonged to Romania, Yugoslavia and Greece (Dobruja, Macedonia and Eastern Thrace). Moreover, only the statistics of the year 1938 are official, while part of those of 1939 and all those of following years are unofficial and must be accepted with a certain caution, also in view of the fact that the information from these sources does not indicate the territory to which it refers.

In 1938, the last year before the war for which more complete and safe statistics are available, oleagineous crops in *Bulgaria* covered a considerable total area amounting to about 741,000 acres, or 7.4 per cent. of all arable lands (10,087,000 acres). This is one of the highest percentages registered in Europe.

Sunflower came first with over 60 per cent. followed by colza with 7 per cent. and soya with 4 per cent. The other exclusively oleagineous crops (groundnuts, sesame, poppy-seed and castor-oil) covered less than 2 per cent. of the arable land of the country. The rest was occupied by textile and oleagineous crops, as cotton, which held a preponderant position among them (18 per cent.), and at a considerable distance, linseed and hemp.

The great importance attained by herbaceous oil-giving crops in Bulgaria is the result of the work of many years. Sunflower has contributed more than any other oil-giving plant to this development, with a steady increase of area: from 10,400 acres in 1921, when all the oleagineous crops together covered a little over 24,700 acres to 467,000 acres in 1938. Cotton growing also registered a very remarkable increase: from 4,180 acres in 1921 to 135,900 acres in 1938. Colza, which, as has already been mentioned, in 1938 covered about 7 per cent. of the total area under herbaceous oil-giving crops is subject to wide periodical variations, sometimes even from one year to the other. For instance, in the period 1921 to 1938 the area under this crop had fallen from à maximum of about 111,200 acres in 1928 to a minimum of about 490 acres in 1924. The fluctuations registered in a smaller meausure in other years, prove that in Bulgaria this crop is quite unstable. The same phenomenon has been noticed in Romania and in some other country. Soya, which in 1938 with 29,700 acres covered about 4 per cent. of the area destined to herbaceous oil-giving crops, began to be grown in Bulgaria only a few years ago. The first trials to cultivate it were made in 1934, and the first statistics on its production appeared in 1936.

The table shows that during the war years, the area under soya increased almost four times, from 1939 to 1942, reaching 173,000 acres in 1942. This figure, however, is still much below that of the area sown to sunflower, which, ofter falling heavily in the years 1939 and 1940, went up to 494,000 acres in 1941, against 467,000 acres (old territory) in 1938.

The increase of the area to cotton, hemp and linseed has been quite remarkable. Castor-oil growing was also greatly developped. Like soya, castor-oil is a recent crop in Bulgaria. In 1935 it covered about 620 acres; in 1942 it had gone up to about 24,700 acres. As regards poppy-seed, the 1943 agricultural plan foresees the utilisation of about 24,700 acres, mostly in the newly annexed territory. Data on the other oleagineous crops (groundnuts, sesame and colza) are lacking; but, owing to their specific character and (except in the case of colza) their limited spread in Bulgaria before the war, it is quite probable that there has been no important modification in the area sown to them.

Summing up, it may be approximately estimated that the total area under oil-giving crops in present-day Bulgaria amounted to 865,000 acres in 1941 and a little over in 1942; while in 1938, in the territory of old Bulgaria, these crops covered about 741,000 acres. In proportion to the territorial changes that took place in that country after 1938, this increase is comparatively poor, and must be attributed to the small development of sunflower growing which holds a pre-eminent place among the oil-giving crops of Bulgaria. As the agricultural press has remarked, the preference given in late years to soya over sunflower must be attibuted to the fact that sunflower is considered a crop that impoverishes the soil, while

soya, on the contrary, makes it richer in nitrogen. Soya growing in Bulgaria, not only has been extended over fallow land, but has also partly taken the place of rose growing, which, owing to the big slump in the price of rose-oil, had become almost or altogether unremunerative.

Yields in the period 1935 to 1939 varied between 535 lb. and 892 lb. per acre in the case of sunflower, and 535 and 848 lb. per acre in the case of colza, 259 and 446 lb. per acre in the case of cottonseed, 196 and 419 lb. per acre for hemp-seed, and 571 lb. per acre for linseed. In 1942, when the drought did very serious damage to these crops, soya yields which in 1939 had amounted to over 803 lb. per acre hardly reached 446 lb. per acre. In 1941, castor-oil had yielded 1,160 lb. per acre.

The Bulgarian Government which in pre-war years had taken some measures to encourage the spread of oil-giving crops in the country, has extended and intensified them in the years of the war. Tobacco and gourd seeds, grape-stones, maize sprouts, etc., which heretofore had been used for the production of oil only in very small scale, were also controlled by the measures. It may be stated that at present all oleagineous products have been put under the control of the Government through the centralisation of deliveries and the fixing of prices. The Government also encourages the creation of a larger number of oil factories with a view to organizing oil extraction within the country and thus insuring the production of a greater quantity of oil cakes needed for the improvement of livestock raising.

In 1942, prices in levas per 100 kg. fixed by the Government, were as follows: sunflower and colza 620, soya 650, tobacco and gourd seeds 1,000, poppy-seed (white) 1,200, white mustard 2,000, groundnuts 2,200 and sesame 3,000 levas.

In the same year, the price of soft wheat was 620 levas per 100 kg.

In *Greece*, which within its pre-war boundaries, in the five years 1935 to 1939 had registered a yearly average production of about 120,000 metric tons of olive oil and occupied the third place among the European oil producing countries after Spain and Italy, the cultivation of herbaceous oil-giving plants was rather small and may be said to have been limited to cotton and sesame. Attempts at the production of sunflower had not been at all encouraging. According to unofficial information the area under this crop had increased from 1,000 acres in 1938 to 1,600 in 1939; average yield had amounted to about 714 lb. per acre.

During the three-year period 1937 to 1939, oleagineous crops were reported by Government statistics as follows:

Crops	Area (acres)			Production (metric tons)		
	1937	1938	1939	1937	1938	1939
Cottonseed	178,355	169,455	190,037	38,200	31,700	31,700
Sesame	88,369	86,120	118,061	9,900	5,100	19,000

During 1939, the area under sesame was considerably increased; the total area under cotton and sesame amounted to about 309,000 acres, viz., to over 5 per cent. of arable lands, not including fallow land, which is undoubtedly quite extended over the country. In 1940, the area under cotton, which had notably increased since 1935, maintained almost the same level as in 1939.

No reliable statistics are available for the territory of present-day Greece; but it is quite possible that, owing to territorial reduction, the total area under oleagineous plants be now considerably smaller than before the war, notwithstanding a partial compensation due to the recent introduction of such crops as linseed, hemp, groundnuts and sunflower, which before were grown in Greece on a small scale or not at all.

Owing to teritorial changes during the first years of the war and the lack of many statistical data, official and unofficial, it is impossible to thoroughly survey the situation of oleagineous crops in *Romania.*

In the following table are contained the available official data for the years 1938 to 1941; the figures for the years 1938 and 1939 refer to the whole pre-war territory, while those for the years 1940 and 1941 do not include the territories of Southern Dobruja, Bessarabia, Northern Bukovina and of a part of Transylvania, which in 1940 were transferred to Bulgaria, the U. S. S. R. and Hungary.

Crops	Area (acres)				Production (metric tons)			
	1938	1939	1940	1941	1938	1939	1940	1941
Hempseed	125,833	142,878	80,461	...	24,700	23,700	4,800	...
Linseed	37,432	30,031	32,695	30,753	5,500	5,200	4,900	5,600
Cottonseed	12,432	17,374	45,238	...	1,500	2 600	3,700	...
Colza	205,990	151,176	69,114	72,912	53,000	35,800	14,400	14,300
Sunflower (unmixed crop)	496,153	404,784	354,868	586,610	197,700	142,400	133,900	169,200
Sunflower (mixed crop)	...	...	125,687	225,653	...	...	...	...
Soya	139,043	255,622	...	...	49,100	86,100	...	...
Poppy-seed	5,696	5,730	2,805	3,291	1,300	1,350	495	690
Mustard	5,959	3,319	4,082	4,112	500	530	700	1,130
Castor-oil	1,369	761	336	1,497	300	135	95	217

In 1938 and 1939 oleagineous crops in Romania covered an average area of 1,021,000 acres yearly, i. e., a little over 3 per cent. of the arable lands of the country, including about 1,200,000 acres fallow land. The group of textile-oleagineous plants (hemp, flax and cotton) covered about 18 per cent. of the total area under oil-giving crops, among which hemp predominated altogether over flax and cotton. In the group of pure oleagineous crops, covering the largest area, first place was held by sunflower (about 44 per cent.), followed by soya and colza (37 per cent. together), while poppy-seed, mustard and castor-oil covered only 1 per cent. of total area.

In 1921, sunflower growing, which had already considerably spread before the first world war, covered 72,000 acres. Owing to a steady increase and a remar-

kable spread over the whole country, the area to sunflower in 1925 amounted already to 418,000 acres and since that year until 1939, there were only small variations between a minimum of 393,000 and a maximum of 504,000 acres. The area under colza, which in 1921 was 104,000 acres, in the following years varied between a minimum of 91,000 and a maximum of 314,000 acres. This maximum was reached only once in 1935. After that year it began to decrease, until in 1938 it fell to 205,000 and in 1939 to 151,000 acres. In 1938 and 1939, a similar decrease was registered also by sunflower (from 497,000 to 405,000 acres. From one to the other of those years, on the contrary, the area under soya increased very heavily. The first trial of this crop, which were carried on with the aid of German industry, had only begun in 1934 over 3,500 acres). In the next years, the increase was very remarkable; in 1938 it amounted to 138,000, and in 1939 to 255,000 acres. As regards the other oleagineous crops, no important change took place in the period 1921 to 1939: the area under them in Romania is very small anyway. It may mentioned that the area under castor-oil, after increasing from 247 acres in 1931 to a maximum of 4,550 acres in 1936, fell rapidly again in the following years to about 740 acres in 1939. Among the textile-oleagineous crops, the area under hemp did not change much; in recent years, however, there has been a tendency to an increase. Flax growing, after a remarkable extension in the period 1931 to 1937, has decreased in the following years. The area under cotton, on the contrary, after the first trials which lasted however some, years, from a little over 5,000 acres in 1938, increased to 17,000 acres in 1939.

Summing up, on the eve of the war the production of oil-giving crops expressed in oil was yielded mostly by sunflower (53 per cent.), colza (20 per cent.) and soya (20 per cent.). Average yields per acre in 1938 and 1939, were: sunflower, 830 lb., colza 544 and soya 758 lb.

For 1940 and 1941, available statistics which, as we have already mentioned refer to Romanian territory without Dobruja, Bessarabia and Northern Bukovina, and consequently are not comparable, with those of the two preceding years, show that there was a striking increase of the area under sunflower: between 1940 and 1941, the increase was 64 per cent. for the unmixed crop and 80 per cent. for the mixed crop. No data are available for soya in 1940 and 1941. No noticeable change took place between 1940 and 1941 in the area under colza.

For 1942, after the reoccupation of Bessarabia and Northern Bukovina, which took place in 1941, press information and statistical data are too fragmentary and often also too contradictory to be of any value. Yet one may gather from them that the area under sunflower and soya has heavily increased even in comparison to pre-war conditions in the old territory which included Southern Dobruja and the part of Transylvania surrendered to Hungary.

This increase must be attributed to the measures taken by the Government in recent years to encourage these two crops as well as others like hemp, flax and cotton. Considerable efforts are also made with a view to a more complete utilization of gourd seeds, grape-stones, and maize sprouts. These products, taken all together, may represent a considerable part of country's production of vegetal oils.

The importance of oleagineous crops in *Hungary* during the three years 1938 to 1940, appears from the following official figures:

Crops	Area (acres)			Production (metric tons)		
	1938	1939	1940	1938	1939	1940
Hempseed	37,100	32,100	34,600	1,200	1,400	1,600
Linseed	29,650	29,650	32,100	8,900	9,400	...
Sunflower (unmixed crop)	16,800	19,300	40,500	7,400	8,600	19,500
Sunflower (mixed crop)	(430,200)	(430,500)	(406,500)	23,800	23,800	28,600
Colza	28,050	26,200	7,400	11,400	11,000	1,700
Soya	...	7,400	12,350	3,400	5,200	..
Poppy-seed (unmixed crop)	19,700	26,500	...	4,100	6,600	...
Poppy-seed (mixed crop)	(67,700)	(67,700)	...	2,200	2,000	...
Castor-oil	...	4,100	...	...	1,800	...

The figures for each year considered in the table, refer to different territories: for 1938 they refer to Hungary within the boundaries fixed by the Treaty of Trianon; for 1939 they include the re-annexed Northern zone; for 1940, besides the re-annexed Northern zone, they include alzo Sub-Carpathia, both of which regions had formerly belonged to Czecho-Slovakia.

In pre-war Hungary, viz. within the boundaries of 1938, the total area under oleagineous crops (except sunflower and poppy-seed in mixed crop) covered about 131,000 acres of which about one half under flax and hemp. The other half was distributed between colza (20 per cent.), poppy-seed (15 per cent.) and sunflower (12 per cent.). The total area under oleagineous crops was hardly one per cent. of all arable lands and about one half of fallow land.

From the point of view of the production of oil that could be obtained from these products, sunflower (unmixed and mixed crops taken together) occupied the first place with about 45 per cent. of the total. Colza followed with 23 per cent., poppy-seed (unmixed and mixed crops) with 14 per cent., while the remaining 18 per cent. represented the production of flax and hemp, with an absolute predominance of the former.

The statistics for the years 1939 and 1940, although, owing to territorial changes they are not comparable between themselves or with those of the year 1938, can furnish some useful indication. In 1939, on an area of arable land which was about 12 per cent. larger than that of the year before, the total area under oleagineous crops was about 145,300 acres, viz., 11 per cent. larger than that of 1938. In other words, no changes worth mentioning took place in the relative importance of the area destined to oil-giving plants taken all together. An interesting item in the statistics of 1939 is the appearence of soya and castor-oil which were new crops in Hungary. In 1940, after the new territorial enlargement of the country and of arable land, there was a considerable increase of area under soya and sunflower (unmixed crops) and a striking decrease of the area under colza.

The development of the chief oleagineous crops in Hungary during the years between the end of the first world war and the beginning of the second, may serve to explain the tendencies prevailing during the years after 1940. In 1927, the

area under sunflower (unmixed crop) covered only about 5,000 acres, and its increase before the latest years was rather slow. The area under sunflower associated with other crops (especially maize) did not change much. As regards colza, on the contrary, after considerable variations from year to year, the area sown to it in 1938 was about 60 per cent. smaller than the 69,000 acres reported in 1921. Striking variations were registered also by poppy-seed (unmixed crop) which in some years reached a maximum of over 47,000 acres while at other times it fell to a minimum of 5,000 acres.

As the problem of oil supply was becoming more difficult, the Hungarian Governement, since 1938 had taken several mesaures to encourage the production of oleagineous seeds (obligatory growing of oil-giving crops, price fixing, publicity, credit grants, delivery of seeds, grant of a certain quantity of oil-cakes, etc.). These measures which from the beginning had been very rigid, were displaced by a series of regulations contained in a decree of the 8th of August 1942, that were judged better suited for the solution of the complex problems always raised by compulsory policies in the matter of agricultural production. According to this decree, each head of holding cultivating an area of arable land above 21 acres is obliged to cultivate 7 per cent. of this area to oleagineous crops as principal crops. The oleagineons plants taken into consideration are sunflower; colza, linseed, soya, castor-oil plant, flax and hemp for fiber and seed.

A very detailed list indicates for each section (*járás*) or municipality of each department, which are the obligatory oleagineous crops.

Holdings are subdivided into two categories: *a*) holdings possessing arable land of from 21 acres to 142 acres and *b*) holdings possessing over 142 acres of arable land.

The cultivation of the castor oil plant is not obligatory for holdings of the first category, which however must cultivate other industrial plants over 7 per cent. of their arable land. The second category must cultivate some castor-oil plants if the soil and climate are favourable to that crop. In that case, 3 per cent. of the arable land must be sown to castor-oil plants and 4 per cent. to other crops officially specified.

In order to intensify the cultivation of the castor-oil plant, each 100 square meters sown to this crop above the obligatory quota of 3 per cent., are considered equal to 125 m² of any other oleagineous crop. The same advantageous calculation is granted farmers who grow castor-oil plants on good soil and on the basis of a production contract, even though they are not obliged to cultivate that plant.

In order to facilitate to farmers the choice of the crops, the total or partial substitution of one crop for another is allowed, provided the substitution is based on a production contract, with the exclusion of the castor-oil plant. As a substitute for a certain crop (castor-oil plants excluded) one may choose one or several crops among those indicated in the decree; or one may choose to grow poppy or camline and perilla as supplementary crops. The value of substitute crops from a legal point of view is as follows:

100 m² of colza are equivalent to 100 m² of the area prescribed by the law; 100 m² sown to any crop whatsoever (except castor-oil and colza)

are equivalent to 75 m²., and finally 100 m² of supplementary crops (camline and perilla) and of fodder gourds (cultivated on one's own land and on the basis of a production contract) are equivalent to only 50 m².

If Autumn flax or colza have been destroyed before April 15, they must be substituted with other oleagineous crop.

The area under tobacco for seed production may also be included in the quota of the acreage legally allocated to oleagineous crops.

Statistics for the years 1941 and 1942 are only unofficial and fragmentary. Press reports stated that the acreage destined to oleagineous crops had already been increased by 50 per cent. in some zones of Hungary during the 1941 season. From other unofficial quarters, reports were sent out that in 1942 24,700 acres would be sown to castor-oil, 74,100 to colza, 247,100 to sunflower (unmixed crop). Although no information is available regarding other oleagineous crops, such as soya (to which the measures taken by the Hungarian Government assign a very important place), poppy-seed, linseed and hemp-seed, the fact itself that such increases as stated above were effectuated, would lead to the conclusion that, even without taking into account the enlargement of present-day Hungary as compared with 1938, the acreage destined to oleagineous crops in 1941 and 1942 was considerably larger than in pre-war times.

As regards data on the prices of oil-giving seeds in 1942, only the following ones, in pengö per 100 Kg., are available: sunflower 50, soya 60, colza 68, linseed 75 and castor-oil 100 pengö. During the same year, the price of wheat was 50 pengö per 100 kg.

The measures contained in the decree of August 1942, not only establish a severe discipline in the cultivation of oleagineous plants, and grant farmers several important advantages, but make it sure that a further impulse will be given to oil production in 1943.

Conclusions.

The relative importance of the different crops in the production of herbaceous oil-giving plants in Europe and their geographic distribution determined not only by climatic and soil conditions, but also by the economic and agricultural structure of the different European countries, are essential elements that must be taken into cansideration to fully appreciate the efforts accomplished in Europe to obtain a larger production of oleagineous seeds. Nor the fact must be overlooked that, among the crops surveyed, linseed, hemp and cotton form a group apart with special characteristics of its own. As a matter of fact these crops are chiefly intended to furnish textile fibers which represent their principal product and greatest value, while their seeds are generally considered a secondary product. It is impossible, therefore, to establish exactly how far the decision of increasing these crops was prompted by the intention of getting a greater amount of oleagineous products. At any rate, in the three years 1935 to 1937, linseed, hemp and cotton covered in Europe one half of the acreage destined to all the oleagineous crops together, and yielded about one third of the oil obtained from all those crops. The other half was distributed among herbaceous oil-giving crops, and sown

especially to sunflower (22.8 per cent.), colza and rape-seed (16.7 per cent.), soya (4.4 per cent.), All these crops together occupied an acreage only slightly smaller (43.9 per cent.) than that covered by textile-oleagineous plants. The rest was destined to other crops, such as sesame, poppy-seed, mustard, groundnuts and castor-oil. The group of the most important herbaceous oleagineous plants (sunflower, colza and soya), contributed in a greater measure to total oil production (57.7 per cent.) than to total acreage. The remaining 10 per cent. was contributed by poppy-seed, groundnuts, mustard and castor-oil.

These summary data clearly indicate on which oleagineous crops had to be concentrated the endeavours of the European countries to increase their production of oil-giving seeds. The south-eastern zones of Europe, where the most important oleagineous crops are sunflower, colza, rape-seed and soya, could furnish the reserves of agricultural land on which the largest spreading of these crops would be possible.

Let us now examine, as far as the available, very often uncertain and fragmentary, documentation allows it, the results obtained in the different parts of Europe.

In the group of *Scandinavian* countries (Norway, Sweden, Finland and Denmark) where oleagineous crops before the war were pratically unknown, the greatest efforts were made by Sweden and Denmark. In 1942, these crops covered about 45,700 acres in Sweden. White mustard predominated. Among the other crops figure also sunflower and soya, which are grown over a small area. In the same year, Denmark brought the area under these crops up to about 66,700 acres. Here, as well as in Sweden, white mustard predominated. Finland is still at its first trials: about 1,200 acres in 1942. But it is proposed to increase these crops considerably. Until now, no attempts along these lines have been made in Norway. In 1942, the Scandinavian countries, taken all together, grew oleagineous crops over 113,700 acres, of which 74,100 under white mustard.

Owing to the fact that statistics are utterly fragmentary and incomplete, it is impossible to give any statistical estimate on the results of endeavours made by the *Baltic countries* (Estonia, Latvia and Lithuania) and by the *General Government* to increase their production of oil-giving seeds. Before the war, the growing of oleagineous plants was essentially limited to colza which covered about $^1/_6$ of the total area under them.

In the group of the countries of *Central Europe* (Germany, Switzerland, Slovakia and the Protectorate of Bohemia and Moravia), official statitical data are available only for Slovakia and Switzerland whose importance as oil-seed producing countries is comparatively small. In 1942, Switzerland increased its oleagineous crops, which before the war were practically unexistent, to about 3,000 acres. Data on Slovakia are more interesting. This country, in fact, may be considered rather representative of present-day tendencies in a considerable part of Europe. In 1939, the total area under oleagineous crops amounted to about 24,700 acres, $^2/_3$ of which under linseed and hemp; the rest was left to all the other crops, among which poppy-seed predominated. This situation did hardly change in 1942, while a large increase of acreage to oleagineous crops is foreseen in 1943, when it should amount to 32,100 acres, against 8,600 in 1942.

Most of this acreage is destined to colza and poppy-seed. An increase is foreseen also in the area under soya and especially sunflower.

As regards Germany and the Protectorate of Bohemia and Moravia, no sure figures are available. It can only be said that there has been an increase of acreage under oil-giving plants, especially colza. According to some private source, this increase has been very big, at least in Germany.

In the case of the countries of *north-western Europe* (Belgium, France and the Netherlands) official statistics are available only for France, where the area under oleagineous crops, viz. colza, rape-seed, poppy-seed, sunflower, etc., has increased from 22,200 in 1938 to 84,000 acres in 1942. It may be remarked that along with this increase of area under colza, rape-seed and poppy-seed, is now figuring for the first time in French statistics an area of about 20,000 acres under sunflower. This crop was recently introduced into France. Soya has begun to be cultivated in the southern part of the country. According to the plans of the Government, in 1942-43 the area destined to oleagineous crops, not including linseed and hemp, should amount to 222,400 acres. As regards Belgium, available official data concern only colza which in 1939 was sown over hardly 42 acres, and in 1942 rose to 1,134. Information from private sources, indicate that linseed which in 1939 covered 111,200 acres, was raised on only 37,100 acres in 1941 and 24,700 acres in 1942. In 1943, the area under linseed should be augmented at least 10 per cent. as compared with 1941. Official Netherlands data concern only colza whose acreage, together with that of rape-seed, should be increased from 740 acres in 1939 to 123,600 in 1942-43.

Colza and rape-seed registered the greatest increase of area in the north-western countries taken all together. Judging from the figures that have been gathered about France and the Netherlands, the area under these crops which in the period immediately befare the war averaged about 24,700 acres, should increase several times in 1942 and even more so in 1943.

In the group of the *south-western countries*, (Portugal, Spain and Italy), herbaceous oil-giving crop were grown, in pre-war times, only in Italy, and even there in a comparativel small measure.

In Italy the greatest endeavour is made to spread cotton and linseed growing which in 1938 covered together about 118,600 acres. These crops, according to the plan of the Government, should cover, in 1942-43, more than 315,600 acres, of which 223,900 under cotton and 91,700 under linseed. In 1938, herbaceous oil-giving crops (colza, rape-seed, groundnuts, sesame, sunflower and soya) covered a total area of about 7,200 acres, mostly under colza and rape-seed. In the years of the war, great efforts have been made to increase the acreage under all these plants, especially colza and rape-seed in the northern and sunflower and soya in the central and southern part of the country. The Government's plan for the year 1942-43 assigns to oleagineous crops other than cotton, linseed and hemp, about 44,500 acres. Spain shows a great interest in the introduction of sunflower, which in 1943 should cover an area of 123,600 acres. In Portugal where in pre-war times herbaceous oil-giving crops were practically unknown, there has been no change worth mentioning. Summing up in the countries of the south-west of Europe which is the most important center of olive oil production, the acreage

under herbaceous oil-giving plants was in the past comparatively small. A growing interest in new crops (sunflower and soya) and in an increase of areas under cotton and linseed is now noticeable.

A special steadily growing interest in these crops has been shown in the *countries of south-eastern Europe* (Albania, Croatia, Serbia and the Banat, Greece, Bulgaria, Romania and Hungary). Before the war, the total production of oil-giving seeds expressed in oil in these countries amounted to about one half of the entire production of Europe. Herbaceous oil-giving crops were and still are represented there by a larger number of species than in any other section of Europe. Textile-oleagineous crops, (flax, hemp and cotton) spread over one fourth of the areas destined to all oil-giving crops in this group of countries, with an oil production amounting to about 13 per cent. of the total. Both as regards acreage and specially the quantity of oil produced, exclusively oleagineous plants predominate. Among them sunflower comes first, followed at a great distance by colza and soya. Their production amounts to about 4/5 of the whole, while only about 1/5 is produced by all the other oil-giving crops of this group (sesame, poppy-seed, groundnuts, castor-oil and mustard).

Area under sunflower, colza and soya in the countries of south-eastern Europe.

Years	Romania	Bulgaria	Yugoslavia	Hungary	Total
	(Thousand acres)				
Average 1921-1925	311.1	29.2	7.4	42.0	389.7
,, 1926-1930	562.2	159.6	18.5	31.9	772.2
,, 1931-1935	650.4	298.8	25.7	39.0	1,013.9
,, 1936-1938	873.5	492.5	80.1	35.1	1,481.2

Following a steady increase, the total area under sunflower, colza and soya in the four countries surveyed, almost quadruplicated in the period 1921-1925 to 1936-1938. The most important centers of production of these crops in that part of Europe, were Romania and Bulgaria which, in the years 1936 to 1938 contributed 60 per cent. and 33 per cent. respectively to the total acreage under these oleagineous crops. In all the counries of that part of Europe,considerable efforts have been made during the war in order to still increase the production of oil-giving seeds. The best results have been obtained with soya and sunflower, while the increase of the acreage to colza was not so accentuated. Available data are not sufficient to establish correctly the importance of the most recent progress made, but it is undeniable that the importance of the countries of this group as contributors to the total European production of oil-giving seeds, has considerably increased during the war years.

From this survey intended to illustrate the situation of herbaceous oil-giving crops in the different groups of European countries, appears quite clearly that the number of these crops that have actually a great importance in European production, is comparatively small, and essentially limited to colza, sunflower and soya.

Colza is one of the oldest oleagineous European crops which, in recent times, was raised over a considerably large area in many regions of central and north-

western Europe. But later on, its cultivation began to steadily decrease until in 1933 it registered the lowest level ever attained (about 247,100 acres). In the following years there was a notable revival, so that in the three-year period 1936 to 1938, the area under colza was again up to about 642,500 acres. During this same period, the most important centers of production of colza were Germany, Poland and the countries of south-eastern Europe where it covered about one half of the acreage under this crop in the whole continent.

While in most of the countries of central and south-western Europe the increase of the area under colza during the years of the war represents a revival of a crop which in pre-war times had been steadily decreasing, in the south-eastern part of Europe, on the centrary, it was simply the continuation of a development that had been going on for some time. In that part of the continent, in fact, the area under colza, from a yearly average of 163,100 acres in the period 1921 to 1925, went up to 219,900 acres in the years 1926 to 1930, 239,700 acres in 1931 to 1935 and 301,500 during the three years 1936 to 1938.

Romania, which in the three years 1936 to 1938 devoted about 210,000 acres to colza, represented and still represents the chief center of production. The area under colza in Yugoslavia, Bulgaria and Hungary, was comparatively modest. In the latter two countries, on the eve of the war, there had been signs of a tendency to a decrease. Compared with unit yields in many countries of central and north-western Europe, colza unit yields in the countries of the south-east are rather low. This circumstance, the small resistance offered by colza against winter cold which in some years does serious damages, and finally the competition of other oleagineous crops, appear to be the causes of this limitation in the increase of the acreage under colza in the south-eastern parts of Europe. This increase, between the first and the second world war, compared with the acreage under sunflower and soya in the same period of time, was only 85 per cent.

Sunflower may be considered a new crop in Europe, because it was utterly unknown there before the first world war. It is only in 1921 that we find statistics registering a total area of 81,500 acres under this crop in Bulgaria and Romania. In the following years, sunflower went on spreading very rapidly over the countries of south-eastern Europe, where climatic and economic conditions are quite favourable to it. The figures appearing in the following table indicate the successive steps of the development of this crop which, on the eve of the second world war, was almost entirely concentrated in the south-eastern European countries.

Area under sunflower in the countries of south-eastern Europe.

Years	Romania	Bulgaria	Yugoslavia	Hungary	Total
	(Thousand acres)				
Average 1921-1925	195.2	26.4	—	5.7	227.3
„ 1926-1930	421.3	124.0	—	6.2	551.5
„ 1931-1935	434.7	233.0	5.4	9.9	683.0
„ 1936-1938	498.4	440.6	27.7	14.6	981.3

In the period between the world wars, the area under sunflower had increased four times, in a larger measure in Bulgaria than in Romania. In the three years 1936 to 1938, 50 per cent. of the area under this crop was in Romania, 45 per cent. in Bulgaria and 5 per cent. in Yugoslavia and Hungary. It must be mentioned, however, that these figures refer exclusively to the unmixed crop, while in Hungary, where sunflower is widely associated with other crops, especially maize, the importance of mixed production is considerably higher than that of the unmixed crop In 1938, for instance, on an area under mixed crop amounting to 430,000 acres, were harvested 23,800 metric tons of sunflower seeds, while the unmixed crop spread over 16,800 acres, yielded only 7,400. m. t.

There is good reason to believe that sunflower associated with other crops is common enough also in other countries of the south-east of Europe, but no data are available in this regard.

In the war years, sunflower has further spread over all the most important centers of south-eastern Europe and has begun to be cultivated also in Spain, France, Italy and Slovakia. Attempts at its introduction have been made also in Sweden with good results.

Soya has equally spread especially in the south-east of Europe, where this crop has found quite favourable agro-geologic and climatic conditions. The area under this crop has increased, in a few years from about 91,400 acres in 1935 to 346,000 in 1939, including Romania (254,500 acres) where this crop is mostly grown in Bessarabia and Dobruja. In 1939, Bulgaria turned 74,100 acres to soya growing. In the same year, Yugoslavia and Hungary taken together dedicated only 17,300 acres to this crop. During the war years soya growing received a further impulse, which must be attributed chiefly to the systematic activity of German industry and to a system of contracts concluded with farmers for the exportation of this products into Germany. In many other countries (Italy, France, Slovakia, some regions of Germany and Sweden -- in the latter country, however, with negative results) soya has begun to be cultivated in recent times. It may be mentioned that, among the most important herbaceous oil-giving plants, soya gives the best possibilities of expansion. It is known, in fact, that unless oleagineous seeds are transformed in the country of production and oil cakes are used in the country itself, these oil-giving crops must be considered as damaging for the soil. Soya, on the contrary, it being a legumineous plant, enriches the soil with nitrogen through its root system and thus it presents a great advantage over the other oleagineous crops. Mention must be made also of the fact that as the oil percentage of soya is rather low, the cakes obtained from the processing of this product contain a high percentage of nitrogenous substances which are extremely useful for livestock feeding. In this connection it is worth mentioning that among the many different measures taken to encourage the growing of oleagineous crops in many countries (even in those which, before the war exported a large quantity of oil cakes) figures the obligatory delivery of a certain proportion of these derivatives to the farmers, that provide the oil-giving seeds.

A wide and sure spread of soya growing in Europe is subordinated to several conditions, among which the choice of selected varieties suited to the climate

and soil of the different countries and zones. This choice requires long years of study and experimentation; yet the example of the United States, which after a long and systematic period of selection and improvement of cultural methods were able, in a short time, to increase the area under this crop to 5 million acres in 1940 and to obtain a production of 2,173,000 metric tons thus reaching the third place among large soya producers of the world, may be considered an evidence of the possibilities open in Europe to this crop in general and especially in some regions. Naturally these possibilities are subordinated to the amount of areas available for this purpose. Among them fallow lands, or prairies or also other soils now under less remunerative crops, come first.

While it is impossible to even approximately estimate what portion of fallow lands might be transformed into arable soil for rotation crops, or how long it would take to effectuate this transformation it can be mentioned that in 1938 fallow land areas in the Scandinavian countries amounted to 900,000 acres, in the Baltic countries and former Poland to 5,000,000 acres, in Central Europe to 1,421,000, in the group of the north-western and south-eastern countries except Greece, respectively to 4,201,000 and 3,600 000 acres.

Summing up, the endeavours made in Europe in order to increase its vegetal oil production, whose scarcity is one of the most delicate points of European economy, have undoubtedly obtained appreciable results, which however are far from what would be necessary to cover the normal needs of the continent. A considerable contribution to these efforts has been given by the utmost utilisation of a certain number of products which heretofore had been utilised only in part or not at all, as for instance, grape-stones, tobacco and tomato seeds, etc.

The policy of price-fixing for almost all oleagineous seeds and the obligatory growing of the most important oil-giving plants in several countries, are the essential part of the measures generally taken to encourage their development. As regards prices, we deem it useful to show, in the following table, the yearly averages in gold frs per 100 kg. on the London market during the five years 1934-1938, paid for the most important oleagineous seeds. For comparison purposes, we also give the price of wheat.

Yearly average prices in gold francs per 100 kg. at London.

((Average 1934-1938)

Products	Prices	Percentages (Wheat = 100)	Percentages (Colza = 100)
Wheat	10.73	100	—
Colza	18.58	173	100
Groudnuts	18.86	176	101
Linseed	19.80	184	107
Sesame	21.99	205	118
Cottonseed	9.86	92	53
Hempseed	13.53	126	73
Coprah	19.90	185	107
Palm almonds	15.59	145	84
Soya	11.40	106	61

Under normal conditions, the introduction of a new crop and its spreading in a certain country or in a certain number of countries is above all an economic problem (i. e., a problem of income). But in European war economy, especially in the field of vegetal oils, the standard today is production at no matter what price.

The lot of oleagineous crops in Europe after the war will depend chiefly on a number of factors which, at the present time, cannot be foreseen and which are mostly bound both to the economic policies that the European countries will follow, and to the more or less advantageous possibilities for them to be supplied by tropical or sub-tropical countries, where conditions are particularly favourable to a low price production.

THE AGRICULTURAL PLAN IN ITALY

We publish herein the plan of cultures for the 1942/43 season according to the areas fixed by the Ministry of Agriculture and Forests. These figures have been compared with those of 1940 and 1929 (the year of the Agricultural Survey).

Crops	Year 1929	Year 1940	1942-43 Season (provisional figures)
	(in 000 acres)		
Cereals cut for grain:	*17,721.6*	...	*19,633.3*
Oats	1,190.6	1,092.5	1,157.0
Wheat	11,655.9	12,566.5	13,336.5
Spring maize	3,251.2	3,296.7	3,268.8
Summer maize	309.6	432.4	498.7
Barley	570.8	502.1	664.0
Rice	368.2	397.6	391.7
Rye	323.7	259.5	276.8
Other cereals	51.6	...	39.8
Industrial crops:	*795.5*	...	*1,143.5*
Sugar-beet	311.1	426.5	421.1
Cotton	13.6	159.4	223.9
Flax	17.8	60.5	91.7
Hemp	292.1	226.8	243.2
Tobacco	93.4	...	120.6
Broom-corn for sugar	—	...	12.4
Other industrial crops	67.5	...	30.9
Oleaginous crops:	*59.3*	...	*45.2*
Leguminous crops for grain:	*3,803.8*	...	*3,411.5*
Beans	1,804.4	1,552.8	1,393.4
Chickling vetches	38.8	...	32.1
Kidney-beans	1,362.1	1,232.3	1,384.8
Lentils	52.6	...	53.1
Lupins	150.5	...	133.7
Peas	68.0	...	67.7
Chick-peas	280.2	...	223.1
Vetches	42.5	...	44.0
Other leguminous crops	4.7	...	79.6
Leguminous products for direct consumption:	*135.7*	...	*197.2*
Edible tubers:	*1,041.3*	*1,061.3*	*1,268.4*
Potatoes	1,041.3	1,061.3	1 268.4
Fresh vegetables and Kitchen gardens:	*651.0*	...	*628.4*
Artichokes	31.4	32.6	36.6
Asparagus	5.4	6.9	6.4
Chards, fennel and celery	20.0	18.5	19.0
Cabbage	120.3	109.2	123.8
Cauliflower	61.0	44.7	52.9
Melons and watermelons	50.7	51.4	35.6
Garlic and onions	30.4	30.4	33.9
Tomatoes	158.6	...	150.7
Other fresh vegetables	77.3	...	57.3
Kitchen gardens	95.9	...	112.2
Other crops of arable land:	*1.0*	...	*2.5*
Flowers and ornamental plants:	*24.0*	...	*17.8*
Feed crops and Bare fallow:	*26,309.0*	...	*25,344.5*
Rotation meadows	6,710.5	7,397.7	7,419.0
Annual fodder crops:			
grown alone	672.4	742.1	798.2
catch crops	1,292.1	1,386.8	1,672.9
Permanent meadows	2,614.7	2,506.7	
Permanent meadows-pastures	915.8	834.0	15,454.4
Permanent pastures	11,136.7	10,700.6	
Bare fallow	2,966.8	...	
Area under Tree and Bush crops	*2,494.3*	...	*3,044.9*
Totals	**53,036.5**	...	**54,737.5**

CURRENT INFORMATION FROM VARIOUS COUNTRIES ON WHEAT, RYE BARLEY AND OATS.

Denmark: The production of meslin is 1942 is estimated at 20,503,000 centals (35,351,000) against 12,641,000 (21,796,000) in 1941 and an average of 15,789,000, (27,223,000) in 1936 to 1940, percentages, 162.2 and 129.9.

Spain: Cereal sowings were completed under excellent conditions.

Wheat. — *Production.*

Countries and Continents	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
France	...	(1) 165,000	(1) 95,000	(1) 160.830	181,070	...	(1) 276,000	(1) 158,000	(1) 268,040	301,770
Italy	...	157,682	156,624	175,971	160,488	...	262,798	261,034	293,280	267,475
Germany (2)	...	...	...	123.757	113,360	...	...	...	206,257	188,929
Spain	(3) 65,120	65,376	47,649	63,271	(4) 78,990	(3) 108,540	108,958	79,413	105,449	(4) 131,650
Romania	...	(5) 43,048	(6) 30,331	98,168	74,045	...	(5) 71,745	(5) 50,551	163,610	123,405
Yugoslavia	...	...	41,597	63,396	53,570	...	...	69,327	105,658	89,822
Hungary	...	...	(6) 45,581	(7) 67,863	48,934	...	...	(6) 75,966	(7) 113,103	81,555
Bulgaria	...	...	37,093	41,400	35,007	...	...	61,820	69,000	58,344
Greece	(3) 7,700	...	20,500	22,974	16,616	(3) 12,900	...	34,200	38,290	27,693
Sweden	10,121	7,300	9,275	18,980	15.474	16.869	12,166	15.458	31,632	25,790
Denmark	441	4,257	4,094	9,143	8,309	735	7,095	6,823	15.237	13,848
Finland	3,724	(5) 3,426	(5) 3,940	5,102	3,580	6,206	(5) 5,710	(5) 6,566	8,502	5,967
Europe	...	(4) *900,000*	(4) *790,000*	*1,025,000*	*958,000*	...	(4) *1,500,000*	(4) *1,320,000*	*1,709,000*	*1,598,000*
U. S. S. R. (in Europe and Asia)	...	...	...	...	792,284	...	...	...	...	1,320,448
United States	5?9,000	567,600	490,030	450,871	430,434	981,000	946,000	816,700	751,437	717,376
Canada	364,613	179,404	330,840	312,381	158,070	607,688	299,001	551,389	520,624	263,444
North and Centr. America	*960,000*	*756,000*	*829,000*	*772,500*	*595,900*	*1,595,000*	*1,260,000*	*1,382,000*	*1,287,500*	*993,200*
Argentina	146,000	134,000	162,706	71,670	146,260	243,000	224,000	271,171	119,450	243,750
South America (9)	...	*170,000*	*195,100*	*106,300*	*181,400*	...	*283,000*	*325,200*	*177,100*	*302,400*
India	...	224,405	241,564	223,172	219,740	...	374,001	402,598	371,197	366,226
Turkey	...	...	92,222	92,685	75,235	...	...	153,700	154,472	125,390
Japan	30,605	32,284	39,681	36,652	28,468	51,008	53,805	66,134	61,085	47,466
Palestine	2,400	2,090	3,000	1,960	1,929	4,000	3,490	5,000	3'270	3,215
Asia (10)	...	(4) *400,000*	*421,300*	*400,100*	*420,200*	...	(4) *660,000*	*720,200*	*666,900*	*700,300*
Egypt	27,815	24,776	29,996	29,405	26,101	46,357	41,292	49,993	49,008	43,500
Algeria	...	19,200	16,561	25,600	20,999	...	32,000	27,600	42,600	34,998
Africa (11)	...	(4) *90,000*	*79,000*	*100,800*	*81,400*	...	(4) *150,000*	*132,000*	*167,900*	*135,600*
Australia	...	96,508	49,593	126,098	92,597	...	160,843	82,654	210,160	154,325
Oceania	...	*102,500*	*54,700*	*131,000*	*96,600*	...	*170,900*	*91,100*	*218,300*	*160,900*
WORLD TOTAL (12)	...	(4) 2,394,000	(4) 2,372,000	2,535,800	2 334,300	..	(4) 3,990,000	(4) 3,954,000	4,226,200	3,890,000

(1) Not including Alsace-Lorraine. — (2) Including Austria. — (3) Unofficial figure. For Greece: present territory. — (4) Partly estimated. — (5) Territory as after all territorial transfers occurred in 1940. — (6) Including the reannexed northern zone and Sub-Carpathia. — (7) Including the reannexed northern zone, without Sub-Carpathia — (8) Not including the territories transferred to the U. S. S. R. in 1940. — (9) Not including Ecuador and Venezuela. — (10) Not including China, Iraq and Iran. — (11) Not including Italian East Africa and Spanish Morocco. — (12) Not including the U. S. S. R. and the countries under notes (9), (10) and (11).

Hungary: During the four weeks ending December 7, the weather was rather cold. Rainfalls were below average over about 9/10 of the country's area. Over a large part of the country, they were even more than half below average. The course of the season allowed farmers to complete everywhere plowing and sowings of cereals. Deep Autumn plowing was done rapidly and covered a far larger area than last year and the average. This will also help Spring plowing and sowing. About December 7, the condition of cereals was generally satisfactory. Early sowings in the month of September owing to the drought in many places, have sprouted unsatisfactorily, or in succesive stages, so that their growth is not uniform and here and there they appear thin. However, after the October rains, seeds were strengthened and sent up suckers. Sowings done in October sprouted generally well and appear uniform. November sowings have partly sprouted and partly were sprouting about December 7. Many late seedings (of the end of November and of the beginning of December) had not begun to sprout at that date. Seedings needed a weather wi hout frosts or a protective blanket of snow, as has already been the case in the north-eastern regions of the country. In many places damages have been caused to seedings by field rats.

Norway: According to press information, cereal threshing is over everywhere in the country. The quality of oats and wheat is not satisfactory, while rye and barley are excellent.

Rye. — *Production.*

Countries and Continents	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
Germany (1)	...	...	...	208,443	179,860	...	...	...	372,221	321,180
Poland	—	—	—	168,200	142,578	—	—	—	300,400	254,604
Czechoslovakia	...	(2) 4,409	(2) 4,403	(2) 5,318	35,226	...	(2) 7,874	(2) 7,862	(2) 9,496	62,903
France	...	...	...	(3) 16,600	16,973	...	...	...	(3) 29,640	30,310
Hungary	...	...	(4) 15,964	(5) 19,041	15,360	...	...	(4) 28,507	(5) 34,003	27,428
Lithuania	...	...	...	14,533	13,594	...	...	...	25,952	24,275
Spain	(6) 14,478	8,755	7,740	9,041	(7) 9,883	(6) 25,853	15,693	13,822	16,145	(7) 17,647
Sweden	9,636	6,156	5,862	7,796	9,024	17,208	10,917	10,468	13,921	16,114
Finland	4,480	(8) 5,140	(8) 4,628	6,737	8,168	7,990	(8) 9,170	(8) 8,263	12,031	14,586
Denmark	9,039	6,755	5,908	5,249	5,697	16,141	12,063	10,551	9,374	10,173
Europe	...	...	...	*540,000*	*494,900*	...	...	...	*965,000*	*883,800*
U. S. S. R. (in Europe and Asia)	...	...	...	...	484,295	...	...	...	...	864,816
United States	33,041	25,307	22,736	21,868	23,116	59,002	45,191	40,601	39,050	41,278
Canada	13,834	7,374	7,837	8,572	3,960	24,703	13,167	13,996	15,306	7,071
North. and Centr. America	*46,875*	*32,681*	*30,574*	*30,439*	*27,075*	*83,705*	*58,358*	*54,596*	*54,356*	*48,348*
Argentina	4,400	3,100	4,678	10,850	5,168	7,900	5,500	8,354	19,370	9,228
South America	...	...	...	...	*5,700*	...	...	...	...	*10,200*
Asia: Turkey	...	...	*10,650*	*9,026*	*7,397*	...	...	*10,019*	*16,117*	*13,208*
Africa	...	...	...	*400*	*400*	...	...	...	*800*	*800*
World Total (9)	...	...	...	591,000	536,000	...	...	...	1,055,000	957,000

(1) Including Austria. — (2) Slovakia. — (3) Not including Alsace-Lorraine. — (4) Including the reannexed northern zone and Sub-Carpathia. — (5) Including the reannexed northern zone without Sub-Carpathia. — (6) Unofficial figure. — (7) Partly estimated. — (8) Not including the territories transferred to the U. S. S. R. in 1940. — (9) Not including the U. S. S. R.

Romania : Sowings of winter cereals have actively continued till the middle of November. In the week ending November 22, the temperature fell heavily in Moldavia, Bessarabia, and Bukovina (—17°). In the Banat, Western Transylvania and Oltenia, it has been milder. In the regions where the temperature was very low, it was necessary to stop sowings, while in those where milder weather prevailed, and where no snow had fallen, plowing and sowings continued. At that date, although the area sown had not reached the 100 per cent foreseen by the plan, it had attained 90 per cent, and in some places it had even gone over the percentage foreseen by the plan. During the last week in November and the first week in December, the weather was milder, and in many places plowing and sowings were continued. At the middle of December seedings were doing well and no damages from frosts had been reported.

Barley. — *Production.*

Countries and Continents	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
Germany (1)	...	...	...	93,957	85,189	...	...	...	195,747	177,480
Spain	(2) 34,895	37,146	30,768	31,260	(3) 39,813	(2) 72,699	77,388	64,101	65,130	(3) 82,946
Poland	—	—	—	32,600	31,116	—	—	—	68,000	64,826
Czechoslovakia	—	(4) 5,840	(4) 6,720	(4) 6,583	24,509	—	(4) 12,170	(4) 14,000	(4) 13,715	51 061
Denmark	30,644	20,144	25,104	27,040	23,900	63,844	41,967	52,301	56,334	49,793
France	...	...	...	(5) 29,920	23,673	...	...	...	(5) 62,330	49,320
Romania	...	(6) 9,608	(6) 10,944	17,999	22,736	...	(6) 20,017	(6) 22,800	37,498	47,368
Sweden	4,888	3,477	4,173	5,108	4 890	10,183	7,243	8,695	10,642	10,200
Finland	(7) 3,175	(7) 2,910	(7) 3,060	4,156	4 158	(7) 6,614	(7) 6,063	(7) 6,375	8,658	8,663
Europe	...	...	...	*348,800*	*338,900*	...	...	...	*726,600*	*706,000*
U. S. S. R. (in Europe and Asia)	...	...	...	...	190,211	...	...	...	...	396,280
United States	200,588	172,177	148,431	131,885	98,232	417,900	358,709	309,237	274,766	204,653
Canada	124,432	56,457	50,043	49,509	38,881	259,234	117,619	104,258	103,146	81,003
North. and Centr. America	*326,000*	*231,000*	*201,000*	*183,540*	*138,830*	*680,000*	*482,000*	*418,000*	*382,370*	*289,220*
Argentina	7,055	8,157	17,390	18,764	11,019	14,698	16,994	36,240	39,092	22,956
South America (8)	...	...	...	*22,700*	*15,700*	...	...	...	*47,300*	*32,600*
India (British Provinces)	...	...	...	...	52,168	...	...	...	...	108,686
Turkey	...	...	49,712	50,590	43,217	...	...	103,569	105,397	90,038
Japan	36,516	36,069	37,199	39,201	34,300	76,077	75,144	77,499	81,669	71,459
Chosen	...	...	...	27,313	25,664	...	...	...	56,903	53,468
Asia (9)	...	...	...	*182,300*	*165,600*	...	...	...	*379,800*	*344,900*
French Morocco	...	...	...	46,910	25,300	...	...	...	97,740	52,710
Algeria	...	15,360	7,919	24,000	15,523	...	32,000	16,498	51,000	32,340
Africa (10)	...	...	...	*85,910*	*50,900*	...	...	...	*178,990*	*106,100*
Oceania	...	...	...	(11) *6,000*	*5,300*	...	...	...	(11) *12,400*	*11,000*
World total (12)	...	...	...	829,200	715,200	...	...	...	1,727,400	1,490 000

(1) Including Austria. — (2) Unofficial figure. — (3) Partly estimated average. — (4) Slovakia. — (5) Not including Alsace-Lorraine. — (6) Territory as after all territorial transfers occurred in 1940. — (7) Not including the territories transferrend to the U. S. S. R. in 1940. — (8) Non including Peru. — (9) Not including China, Iran and Iraq. — (10) Not including Spanish Morocco and Italian East Africa. — (11) Estimate. — (12) Not including the U. S. S. R. and the countries under notes (8), (9) and (10).

United Kingdom : It is officially announced that about one million acres more than last year will be cultivated to cereals next Spring. Forty per cent. of this new acreage will be sown under wheat and 60 per cent. under barley.

Slovakia: Autumn sowings were done under more favourable conditions than last year, and were over by the beginning of December. It is foreseen that the area under wheat and rye will be increased by about 10 per cent, while that destined to the other cereals has remained about the same.

According to press information, a new increase of acreage to cereals is foressen in 1942-43. In the season 1941-42, compared with 1940-41, the increase was 3 per cent for wheat, 3.5 per cent for rye, 2 per cent for oats.

Sweden: According to press information, the area under winter wheat and winter rye will be reduced by 125,000 acres altogether. Winter wheat, which last year covered 335,000 acres, will be sown this year on 270,000 acres, and winter rye will be subject to a reduction of from 455,000 to 395,000 acres.

Argentina: According to an official estimate, at December 12, exportable wheat surpluses amounted to 185,167,000 centals or 308,605,000 bushels against 101,942,000 centals or 169,900,000 bushels at the same date last year. The quality of wheat of the new harvest is good.

Oats. — *Production.*

Countries and Continents	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels				
Germany (1)	...	...	...	151,407	133,786	...	...	...	473,145	418,078
France	...	...	...	(2) 116,210	100,789	...	...	...	(2) 363,140	314,964
Poland	—	—	—	63,500	56,386	—	—	—	198,400	176,204
United Kingdom	...	...	...	38,819	44,503	...	...	...	121,309	139,070
Sweden	20,470	17,101	20,660	28,023	27,853	63,968	53,441	64,561	87,571	87,041
Crecoslovakia	—	—	(3) 4,597	(3) 3,754	27,282	—	—	(3) 14,364	(3) 11,733	85,257
Denmark	22,046	15,891	19,641	21,921	22,198	68,894	49,659	61,378	68,502	69,370
Finland	12,214	(4) 10,626	(4) 11,129	16,936	16,010	38,167	(4) 33,207	(4) 34,778	52,925	50,031
Spain	(5) 13,276	12,469	10,459	10,549	(6) 11,880	(5) 41,488	38,967	32,683	32,966	(6) 37,130
Europe	...	...	...	*584,700*	*549,000*	...	...	...	*1,827,100*	*1,715,000*
U. S. S. R. (in Europe and Asia)	...	...	...	...	394,272	...	...	...	...	1,232,090
United States	426,240	376,357	395,403	299,503	304,179	1,332,000	1,176,107	1,235,624	935,941	950,554
Canada	221,672	120,138	129,379	130,697	110,639	692,724	375,430	404,306	408,425	345,746
North. and Centr. America	*648,000*	*496,570*	*524,860*	*430,260*	*414,890*	*2,025,000*	*1,551,770*	*1,640,160*	*1,344,540*	*1,296,520*
Argentina	15,432	9,921	11,894	19,238	16,367	48,226	31,002	37,168	60,117	51,147
South. America	...	...	...	*22,310*	*20,100*	...	...	...	*69,720*	*62,700*
Asia (7)	...	...	...	*12,100*	*10,000*	...	...	...	*37,900*	*31,700*
Africa	...	...	...	*8,970*	*6,640*	...	...	...	*28,040*	*20,740*
Oceania	...	...	...	(8) *8,600*	*7,900*	...	...	...	(8) *26,900*	*24,800*
World total (9)	...	...	...	1,066,800	1,008,600	...	...	...	3,333,800	3,151,900

(1) Including Austria. — (2) Not including Alsace-Lorraine. — (3) Slovakia. — (4) Not including the territories transferred to the U. S. S. R. in 1940. — (5) Unofficial figure. — 6) Partly estimated average. — 7) Not including China and Manchukuo. — (8) Estimate. — (9) Non including the U. S. S. R. and China.

India: According to the fourth forecast the area cultivated to wheat in 1941-42 amounted to 32,108,000 acres, against 34,862,000 (corresponding revised estimate) in 1940-41 and 34,100,000 on the average during the five years ending 1939-40; percentages: 92.1 and 94.2.

CURRENT INFORMATION ON MAIZE.

Slovakia: It is estimated that in 1942 yields of maize by ha have been 10-15 per cent higher than the year before.

Maize. — *Production.*

Countries and continents	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)
	Thousand centals					Thousand bushels of 56 lbs.				
Romania	...	(1) 73,017	(1) 82,524	133,407	113,347	...	(1) 130,388	(1) 147,364	238,227	202,405
Yugoslavia	—	—	96,567	89,191	103,419	—	—	172,442	159,269	184,678
Italy	...	57,951	75,603	56,930	66,507	...	103,484	135,006	101,661	118,763
Hungary	...	...	(2) 65,345	(3) 51,467	50,841	...	...	(2) 116,688	(3) 91,906	90,788
Bulgaria	...	...	23,590	20,959	17,910	...	...	42,124	37,428	31,983
Spain	...	15,384	16,354	18,589	(4) 14,654	...	27,471	29,204	33,196	(4) 26,168
France	...	...	(5) 9,921	(5) 13,338	11,936	...	...	(5) 17,716	(5) 23,818	21,314
Europe	...	(4) *370,000*	*434,000*	*414,000*	*408,300*	...	(4) *661,600*	*776,000*	*739,000*	*729,100*
U. S. S. R. (in Europe and Asia)	...	...	...	...	76,534	...	...	...	...	136,668
United States	1,778,000	1,496,880	1,371,552	1,457,190	1,174,365	3,175,000	2,673,000	2,449,200	2,602,100	2,097,000
Mexico	...	...	37,049	43,579	36,614	...	...	66,159	77,820	65,383
Canada	...	6,634	3,896	4,535	3,781	...	11,846	6,956	8,098	6,752
North. and Centr. America (6)	...	(4) *1,559,000*	*1,426,000*	*1,519,000*	*1,225,300*	...	(4) *2783,000*	*2 547 000*	*2,712,000*	*2,188,100*
Argentina	...	199,166	225,710	228,730	173,987	...	355,655	403,055	408,448	310,692
Brazil	...	...	...	...	129,388	...	...	...	...	231,050
South America (7)	...	(4) *364,000*	*390,000*	*392,000*	*332,500*	...	(4) *650,000*	*697,000*	*70,000*	*593,700*
India: British Provinces	...	...	...	...	(1) 45,085	...	...	...	...	(1) 80,509
Java and Madura	...	...	...	41,399	44 635	...	...	...	79,926	79,705
Manchukuo	...	...	67,792	54 322	44,198	...	...	121,058	97,004	78,926
Turkey	...	...	16,711	14,019	12,308	...	...	29,841	25,034	21,979
Asia (8)	...	...	*205,000*	*185,000*	*175,500*	...	...	*366 000*	*331,000*	*313,400*
Union of South Africa	...	...	48,647	41,440	43,722	...	...	86,871	74,001	78,076
Egypt	...	...	33,720	33,583	35,618	...	...	60,214	59,970	63,604
Africa (9)	...	...	*117,000*	*110,000*	*116,800*	...	...	*209,000*	*197,000*	*208,700*
Oceania	...	...	*4,400*	*4,400*	*4 400*	...	...	*7,900*	*7,900*	*7,900*
World Total (10)	...	**(4) 2,661,000**	**(4) 2576,000**	**2,624,000**	**2,262,800**	...	**4,752,000**	**4,603,000**	**4,688,000**	**4,040,900**

(1) Territory as after all territorial transfers occurred in 1940. — (2) Including the reannexed northern zone and Sub-Carpathia. — (3) Including the reannexed northern zone, without Sub-Carpathia. — (4) Partly estimated. — (5) Not including Alsace-Lorraine. — (6) Not including Cuba, Honduras, Puerto-Rico and Dominican Republic. — (7) Not including Ecuador, Peru and Venezuela. — (8) Not including Cina and the Indian States of India. — (9) Not including Italian East Africa, Cameroons (Brit. mand. terr.), the cultivations of the natives in Kenya, Spanish Morocco, Uganda, Bechuanaland and Reunion. — (10) Not including the U. S. S. R. and the countries under notes (6), (7), (8) and (9).

CURRENT INFORMATION ON RICE.

Romania : According to unofficial information, the area under rice in 1942 amounted to nearly 10.000 acres. If one considers that before 1938 the culture of rice in Romania was utterly insignificant (official statistics of this crop were started only in 1938), the result obtained in 1942 was certainly very remarkable.

The following table contains available data on the area destined to rice in Romania during recent years :

Area under rice in Romania.

(acres)

Year		
1942 (1)	10.000	(Including Bessarabia and Northern Bukovina)
1940	1.380	(after all territorial cessions)
1939	1.100	(before territorial cessions)
1938	930	(before territorial cessions)

(1) Unofficial figure.

Notwistanding territorial changes, the figures about the area under rice are comparable, because no rice was cultivated over the territories ceded in 1940, except over about 30 ha in the department of Caliacra surrendered to Bulgaria. In 1939, the most important rice center in Romania was Timis-Torental in the Banat.

Import difficulties (normally, Romania imported rice from Italy, Bulgaria, Egypt and India), led the Romanian Government to carry on an intense propaganda among farmers to increase this culture. In 1941 and 1942, with the technical assistence of the competent organs of the Ministry of Agriculture, new rice fields were prepared in suitable soil.

As Romania possesses large areas that can be flooded, especially in the valley of the Danube, and that this country is obliged to import rice from abroad, it seems probable that the culture of rice will continue also after the war.

Chosen: The production of raw rice in 1942-43 is estimated at 63.830.000 centals (141,840,000 sh. tons) against 101,880,000 (226,400,000) in 1941-42 and an average of 87,209,000 (193,794,000) in 1936-37 to 1940-41; percentages, 62.7 and 73.2.

Taiwan: The figure of 15,550,000 centals or 34,550,000 bushels given in our last Bulletin as representing rice production of the first crop of the 1941-42 season, refers instead to 1942-43. Adding the figure of the production of the second crop, we get the total production of the 1942-43 season amounting to 34,170,000 centals or 75,920,000 bushels against 38,053,000 centals or 84,560,000 bushels in 1941-42 and 37,366,000 centals or 83,034,000 bushels as an average for the five preceding years.Percentages: 89.8 and 91.4.

Japan: The production of raw rice in 1942-43 is estimated at 275,780,000 centals (612,830,000 bushels) against 225,453,000 (500,997,000) in 1941-42 and an average of 269,583,000 (599,062,000) in 1936-37 to 1940-41; percentages, 122.3 and 102.3.

CURRENT INFORMATION ON POTATOES.

Spain: According to press information, the 1942 potato production has amounted to 137 million centals — 228 million bushels-against 143 million centals — 239 million bushels-in 1941.

Romania: According to the plan of sowings for the Spring of 1943, the area under potatoes will be again considerably increased.

Slovakia: In 1942 the average yield by ha of early potatoes has been 10 per cent higher than last year. The yield by ha of the potatoes of this season has also been greater, but, owing to the drought, the increase has amounted to only about 6 per cent.

Potatoes. — *Production.*

COUNTRIES AND CONTINENTS	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1938-39)	1942 (1942-43)	1941 (1941-42)	1940 (1940-41)	1939 (1939-40)	Average 1934 to 1938 (1934-35 to 1983-39)
	Thousand centals					Thousand bushels of 60 lb.				
Germany [1]	...	...	1,298,527	1,240,766	1,028,967	...	...	2,164,169	2,067,902	1,714,911
Poland	...	...	...	...	771,764	...	...	...	...	1,286,247
France	...	[2] 264,556	[2] 176,370	[2] 317,687	350,188	...	[2] 440,917	[2] 293,945	[2] 529,468	583,635
Cecoslovakia	...	...	[8] 36,764	[3] 42,593	221,098	...	...	[3] 61,273	[3] 70,988	368,489
United Kingdom	...	...	...	[4] 97,484	110,472	...	...	...	[4] 162,471	184,116
Spain	[5] 136,687	[5] 143,301	86,552	...	[6] 100,024	[5] 227,807	[5] 238,830	144,250	...	[6] 166,703
Belgium	...	...	...	73,264	69,858	...	...	...	122,105	116,428
Italy	...	...	72,729	61,293	60,248	..	...	121,212	102,153	100,412
Netherlands	...	...	...	67,250	59,964	...	...	...	112,081	99,938
Ireland	...	...	69,854	67,166	56,941	...	...	116,421	111,942	94,900
Hungary	...	...	[7] 75,870	[9] 50,552	52,525	...	...	[7] 126,448	[9] 84,252	87,540
Sweden	42,858	45,660	50,583	39,888	40,728	71,429	76,099	84,303	66,479	67,879
Switzerland	27,558	22,046	19,405	14,579	16,477	45,929	36,743	32,341	24,298	27,462
Denmark	37,479	29,011	29,333	26,542	29,260	62,463	48,350	48,887	44,235	48,765
Finland	[9] 21,385	[9] 17,483	[9] 27,207	29,308	28,336	[9] 35,641	[9] 29,137	[9] 45,345	48,846	47,226
Europe	...	...	...	*3.254,000*	*3,321,300*	...	...	...	*5,423,300*	*5,535,300*
U.S.S.R. in Europe and Asia	...	...	...	...	*1,233,987*	...	...	...	...	*2,056,603*
United-States	...	226,025	238.638	217,899	227,869	...	376,701	397,722	363,158	378,774
Canada	...	39,291	42,300	36,390	40 973	...	65,484	70,499	60,648	68,287
North. and Cen r. America [10]	...	...	*285,720*	*259,300*	*272,600*	...	...	*476,191*	*432,000*	*454,300*
Argentina	...	31,791	23,281	23,612	15,058	...	52,984	38,801	39,352	25,096
South. Amer. [11]	...	...	...	*48,700*	*38,700*	...	...	...	*81,200*	*64,500*
Asia [12]	...	...	...	*67,000*	*58,200*	...	...	...	*111,800*	*97,000*
Africa [13]	...	...	...	*15,000*	12,000	...	...	...	*25.000*	*19,900*
Oceania	...	...	...	*8,000*	*10,200*	...	...	...	*13,400*	*17,000*
WORLD TOTAL [14]	...	...	...	**3,652,000**	**3,713,000**	...	...	...	**6,086,700**	**6,188,000**

1) Including Austria. — 2) Not including Alsace-Lorraine. — 3) Slovakia. — 4) Not including northern Ireland. — 5) Unofficial data. — 6) Partly estimated. — 7) Including the reannexed northern zone and Subcarpathia. — 8) Including the reannexed northern zone without Subcarpathia. — 9) Not including the territories transferred fo the U. S. S. R. in 1940. — 10) Not including the Dominican Republic. — 11) Not including Bolivia, Paraguay, Peru and Venezuela. — 12) Not including Cina and Manchukuo. — 13) Not including Cap Vert and Uganda. — 14) Not including the U. S. S. R. and the countries under notes 10), 11), 12), 13).

THE SUGAR SEASON

New estimates obtained through a survey made on November 20 by the ,, International Association for Sugar Statistics " on the European sugar production during the present season, show that there has been a further decrease in comparison with the figures previously gathered on October 16.

This decrease must be attributed., on one side to the general difficulties caused by the war (lack of labour, transportation means, fertilizers) and on the other, to the unfavourable weather conditions which prevailed not only during the last period of the growth and pulling out of beets, but also at the time of sowing and in the first stage of vegetation.

The first estimate on sugar production in Belgium had put it at 12 per cent below that of the year before. The second estimate indicates that, notwistanding a considerable increase of area under sugar beets, the decrease in the production may amount to 17 per cent. The sugar content of the roots, on account of excessive wetness in the Autumn months, is low and yields in sugar are necessarily such also.

A further decrease of 3 per cent over the previous estimate is registered in Denmark. Thus the total decrease reaches 22 per cent, and is much greater than that of the acreage under sugar beets. As in the case of Belgium, too much rain has hindered the formation of sugar in the roots, which, in their turn were rather low on account of retarded vegetation. To all this must be added the damage caused by the difficulties met with at harvest time for lack of sufficient labour hands.

Production of Beet-Sugar (raw).

COUNTRIES	Total production during the season						% 1942-43	
	1942-43 (1)	1941-42	Average 1936-37 to 1940-41	1942-43 (1)	1941-42	Average 1936-37 to 1940-41	1941-42 = 100	Average = 100
	thousand centals			short tons				
Belgium	(2) 4,531	5,467	5,229	(2) 226,536	273,000	261,426	83	87
Bulgaria	882	1,235	613	40,000	62,000	30,670	71	144
Denmark	4,828	6,151	5,019	241,000	308,000	250,954	78	96
Spain.	2,205	3,550	3,630	110,000	177,480	181,400	62	61
Finland	121	91	255	6,100	4,557	12,741	133	48
France	(2) 14,705	(2) 15,873	18,493	(2) 735,000	(2) 790,000	924,654	93	80
Italy	9,480	10,064	9,613	470,000	503,200	480,642	94	99
Lithuania	(2) 331	522	590	(2) 17,000	26,100	29,480	63	56
Romania	926	1,342	2,559	46,000	67,090	127,957	69	36
Serbia	(2) 309	(2) 647	—	(2) 15,000	(2) 32,333	—	48	—
Slovakia	(2) 1,162	1,494	(3) 1,299	58,100	74,710	(3) 64,929	78	89
Sweden	5,926	6,790	6,868	296,300	340,000	343,411	87	86
Switzerland	(2) 419	422	295	(2) 21,000	21,079	14,727	99	142
Turkey	(2) 1,268	2,110	1,676	(2) 63,400	105,518	83,785	60	76

(1) Approximate data. — (2) Data of the International Association for Sugar Statistics. — (3) Average of two years.

As it had been forecast by the ,, General Association of Sugar Producers of Spain ", the Spanish sugar production will be considerably lower than had been estimated at first for the reasons that have been repeatedly mentioned. At present, the forecast is for a production 30 per cent lower than that of the preceding season.

In spite of the favourable report issued by the " Groupe National Spécialisé de la Betterave " which had forecast a good crop in France, the new estimate, dated November 20, points to a decrease of over 7 per cent as compared with sugar production in 1941-1942.

In Serbia, the last estimate is worse than the preceding one, because both in Serbia itself and in the other Balkan states, the long drought has done more damage than had been believed at first.

In Slovakia also the second estimate indicates that the decrease has been bigger than had been believed at first and that it is far greater than that of the acreage under sugar beets.

In Sweden, the decrease as compared with the first estimate, has grown by 3 per cent. This is probably due to the percentage of sugar content, which is smaller than had been previously estimated.

In Lithuania, the production of this season is estimated 37 per cent below that of the preceding one. This big decrease, which is not justified by the far smaller one of the acreage sown to this crop, must be attributed mostly to the delayed growth of the roots and to a lower sugar content.

Considering the total production of the European countries shown in the annexed table, which from the point of view of sugar production represents only 2/5 of Europe (without the U. S. S. R.), the quantities of sugar fabricated this season amount to not more than 85 per cent of the production of the year before and of the average.

E. R.

CURRENT INFORMATION ON SUGAR.

Denmark: The production of sugarbeet in 1942 is estimated at 34,392,000 centals (1,720,000 sh. tons) against 38,921,000 (1,946,000) in 1940 and an average of 34,607,000 (1,730,000) in 1936 to 1940, percentages, 88,4 and 99.4.

Spain.: The sugar season is practically over. Owing to very unfavourable weather conditions in November and to the large amounts of sugar beets consumed for livestock feeding, the delivery of beets at the factories has been lower than had been estimated. In competent circles it is believed that Governmental measures in favour of a considerable increase of the price of beets are about to be taken. These measures are intended to encourage an increase of the area to sugar beets in 1943.

Slovakia: It is estimated that the average yield by ha of sugar beets has been 20-25 per cent. lower than last year. Sugar content, on the contrary, increased 5 per cent.

Java : According to the Japanese press, between the military authorities and Japanese industrials who are to work the sugar cane at Java, arrangements are being made on the quantity of sugar that must be produced. Factories which from 199 had been reduced to 46, will be increased again to 60 beginning with the next month of May.

CURRENT INFORMATION ON VINES.

Bulgaria: According to very recent press information, wine production in Bulgaria this year amounted to 48,4 million Imp. gallons or 58.1 million American gallons. This production is neatly above the average.

Spain: According to very recent information, wine production in Spain this year is estimated at not less than 396 million gallons (476 million American gallons), against an estimate of 363 million gallons, or 436 million American gallons at the end of October.

Italy : According to a communication of the Coordination Committee on Supplies, the amount of wine denounced by producers at the end of December, is above 660 million Imp. gallons or 790 million Am. gallons. It is estimated that this quantity is sufficient to cover the needs of the Army and distillation (20 per cent of the total), together with those of the civil population.

CURRENT INFORMATION ON OLIVES.

Spain: Olive hervesting has begun. During the Autumn, weather conditions were favourable to the olive crop and the season forecasts are now a little more encouraging. Production, however, is estimated low as to quantity and below average as to quality. Yields are particularly poor in the very important province of Jaén.

THE WORLD STATISTICAL SITUATION OF LINSEED, LINSEED OIL AND THEIR MOST IMPORTANT SUBSTITUTES

by A. Di Fulvio.

World production of linseed.

Flax is very widely distributed all over the world: its distribution however changes considerably from one continent to another. If flax is cultivated in Europe and in the U. S. S. R. chiefly for the production of fibre, in the two Americas, in India and in Africa, not only is the production of seeds prevalent, but absolutely exclusive.

Two months ago, in our October Crop report, we had already summarised the salient characteristics of the linseed season 1942-43. Now, more precise information has been received which makes it possible for us to confirm the provisional or approximate information available at that time. We are therefore going to re-examine the world statistical situation of linseed production.

Two months ago, we expressed the view that in Argentina, which is the most important linseed producing and trading country in the world, production would be average. We are now in possession of the first estimate on the crop communicated on December 11 by the Argentine Government, which puts the produc-

tion of the present season at 35,274,000 centals (62,990,000 bushels), viz., at exactly the same figure as in 1941/42, and 7.1 per cent above the average of the five preceding years.

Area, Production and Yield of Linseed in Argentina.

YEARS	Area			Production			
	sown	harvested	% of sown area harvested	total		per acre harvested	
	1,000 acres	1,000 acres	%	1,000 centals	1,000 bush.	centals	bushels
1942-43	6,128	...	...	35,274	62,990	...	...
1941-42	6,746	5,738	85.1	35,274	62,990	6.1	11.0
Aver. 1936-37/1940-41.	*7,354*	*6,015*	*81.8*	*32,946*	*58,833*	*5.5*	*9.8*
1940-41	6,760	5,367	79.4	33,510	59,840	6.2	11.1
1939-40	7,600	5,602	73.7	22,364	39,935	4.0	7.1
1938-39	6,689	5,787	86.5	31,085	55,510	5.4	9.6
1937-38	7,077	5,691	80.4	34,167	61,013	6.0	10.7
1936-37	8,646	7,626	88.2	43,605	77,867	5.7	10.2
Aver. 1931-32/1935-36.	*7,515*	*6,449*	*85.8*	*39,518*	*70,567*	*6.1*	*11.0*
1935-36	6,573	5,604	85.3	33,290	59,446	6.0	10.7
1934-35	8,103	7,104	87.7	44,644	79,721	6.3	11.2
1933-34	6,855	4,878	71.2	35,054	62,596	7.2	12.8
1932-33	7,401	6,395	86.4	34,723	62,005	5.4	9.7
1931-32	8,641	8,263	95.6	49,878	89,067	6.0	10.8

Production this year, while it is not exceptional, can be considered good. In fact, it has been obtained on an acreage which, under the pressure of the heavy stocks still laying unsold in the country, was 9.2 per cent smaller than the year before and 16.7 per cent lower than the average of the five preceding years. The good results obtained must be attributed, therefore, to very favorable weather conditions which advantageously made up for the decrease of the area sown to this crop.

All the productive cycle of the crop, from germination to harvest, was accomplished normally, without any exceptional damage. Consequently the difference between the harvested and sown area will be very small, this year: considerably smaller in fact, than last year (14.9 per cent) and the average of the five preceding years (18.2 per cent).

In *Uruguay*, in spite of a decrease of area under linseed, which, as in Argentina, was made necessary by the difficulty of its export, production this year will be about average.

As a whole, the 1942/43 production in South America, estimated at 36,597,000 centals (65,352,000 bushels), is not much different from that of 1941/42, but it is slightly above the average of the five preceding years (35,053,000 centals or 62,576,000 bushels).

In North America, both in the United States and Canada, linseed in 1942 spread over an area never attained before. The total area under this crop in these two countries (5,931,000 acres), has nearly trebled as compared with the average of the five years ending in 1940, and is 40.6 per cent larger than the record figure of last year (4,200,000 acres).

Productions, favoured by exceptionally good weather, have registered also a record in the annals of linseed production in the two countries, and amounted to three times more than the average of the five previous years

Flax in *Europe*, spread nearly over the whole continent, is especially concentrated in the north-eastern regions, Poland and Baltic countries. Before the war, these countries yielded over 60 per cent of the continent's total production. The agricultural plans, prepared by the different European countries, foresaw a considerable increase of areas under flax. But this increase was not followed by a proportional augmentation of production, because weather conditions were not very favourable to this crop nearly everywhere. Exact estimates are lacking; but total linseed production in Europe (within the boundaries of 1938) may be put at from. 5,510,000 centals (9,842,000 bushels) to 6,610,000 centals (11,810,000). In any case, this year crop was clearly better than that of last year and slightly above the average of the five year period 1936 to 1940 (5,290,000 centals or 9,393,000 bushels). The relative importance of European production, compared with world total, remains very limited (about 7 per cent.).

World Production of Linseed.

(1,000 bushels of 56 lb.).

CONTINENTS	1942-43 (1)	1941-42	Average 1936-37/ 1940-41	1940-41	1939-40	1938-39	1937-38	1936-37
North and Central America	51,966	38,089	16,393	34,644	22,519	9,567	8,031	7,204
South America	65,352	65,745	62,576	62,021	45,234	59,958	64,761	80,902
Argentina	(62,990)	(62,990)	(58,833)	(59,840)	(39,935)	(55,510)	(61,013)	(77,867)
Asia (2)	18,110	18,070	18,149	19,684	18,582	19,133	17,322	16,023
Europe (3)	9,842	7,874	9,393	8,661	9,645	8,858	9,763	10,039
U. S. S. R.	...	...	(4) 29,605	(4) 29,526	(4) 29,526	(4) 29,526	(4) 29,920	(4) 29,526
Africa	433	472	465	472	433	382	535	496
Oceania	39	39	28	39	31	35	20	12
GENERAL TOTALS:								
EXCLUDING U. S. S. R.	**145,742**	**130,290**	**107,004**	**125,521**	**96,444**	**97,933**	**100,432**	**114,676**
INCLUDING U. S. S. R.	...	...	**136,609**	**155,047**	**125,970**	**127,459**	**130,352**	**144,202**

(1) Estimate largely approximate. — (2) Excluding U. S. S. R. and China. — (3) Excluding U. S. S. R. — (4) Unofficial data.

There is no information whatever on this year production in the *U. S. S. R.* Before the war, average production in the U. S. S. R. amounted to 16,530,000 centals (29,605,000) which were almost entirely absorbed by the needs of the country. The greatest part of this production was yielded by the " Dolgunetz "

variety, grown in European Russia over 4/5 of total area. In Ukraine, in the southern region of the Volga basin and in many territories of Central Asia, prevailed the " Kudriash " variety, which was cultivated only for the production of seed.

The linseed producing regions now under the German military regime include, broadly speaking, nearly one half of the area which was normally destined to the " Dolgunetz " variety and 2/3 of the acreage under " Kudriash ". It is known that, in 1942, the German military authorities have done their utmost to exploit the productive capacity of the occupied territories, but nothing is known about results obtained. Nothing is known either whether the Soviet Government has displaced to or intensified in other regions of the interior, the culture of these linseed varieties.

In recent years, the culture of linseed in *India* has shown a tendency to increase. The average area sown to this crop in the years 1936 to 1940 was 3,707,000 acres, against 3,212,000 in the preceding five years. The corresponding production increased 10 per cent (from 8,820,000 centals or 15,748,000 in the years 1931-35 to 9,700,000 (17,322,000) in 1936-40). No official information is available regarding the year 1942; but it seems that the 1942 production was about the same as that of 1941 and very much similar to the average of the period ending in 1940.

Almost the whole African linseed is raised in French Morocco and Egypt. The 1942 production may be estimated as very similar to the average (260,000 centals or 465,000 bushels).

All in all, world linseed production (not including the U.S.S.R.) in 1942-43 reached a record level with 81,615,000 centals (145,742,000 bushels) against 72,962,000 centals (130,290,000) in 1941-42 and an average of 59,966,000 centals (107,004,000) in the five preceding years. This high figure has been reached chiefly as a result of the excellent crops obtained in North America where the heavily increased culture was favoured by very good weather, to the high yields forecast in Argentina and finally to the satisfactory production forecast in Europe. Production in Asia, especially in India, and in Africa is estimated about average.

Summing up, the 1942-43 linseed season was characterised by an exceptional extension of the crops in importing countries, especially in North America, accompanied by a considerable regression in over-producing countries, especially Argentina. But the course of the season, generally favourable to this crop, has caused very high yields which have advantageosly made up for the heavy reduction of acreage under linseed in Argentina.

World trade in linseed.

Until the breaking of the present war, the world linseed supply was assured by practically three countries: Argentina, India and Uruguay which in the years 1934 to 1938 contributed respectively 79.8, 12.9 and 3.8 per cent, or 96.5 per cent of the total world exports. The balance was supplied by the exporting countries of lesser importance: Lithuania, Latvia, Belgium, French Morocco and China.

World Exports of Linseed.

YEARS	Argentina		India		Uruguay		Other countries		Total	
	1,000 bushels	%	1,000 bushels	%	1,000 bushels	%	1,000 bushels	%	1,000 bushels	%
1941	25,649	75.6	(1) 5,905	(1)17.4	(1) 1,575	(1) 4.7	(1) 787	(1) 2.3	(1) 33,916	100
1940	29,613	71.4	(1) 7,086	(1)17.1	3,992	9.6	(1) 787	(1) 1.9	(1) 41,478	100
1939	46,581	74.1	10,629	16.9	4,287	6.8	(1) 1,378	(1) 2.2	(1) 62,875	100
Average 1934-1938	*60,683*	*79.8*	*9,781*	*12.9*	*2,879*	*3.8*	*2,649*	*3.5*	*75,992*	*100*
1938	49,805	75.9	11,472	17.5	2,846	4.3	1,504	2.3	65,627	100
1937	70,942	83.1	8,850	10.4	2,953	3.4	2,653	3.1	85,398	100
1936	58,576	75.1	12,381	15.9	3,027	3.9	4,000	5.1	77,984	100
1935	69,986	86.7	5,173	6.4	2,779	3.4	2,803	3.5	80,741	100
1934	54,108	77.0	11,027	15.7	2,791	4.0	2,287	3.3	70,213	100
Average 1929-1933	*63,677*	*80.9*	*8,389*	*10.7*	*3,198*	*4.1*	*3,402*	*4.3*	*78,666*	*100*
1933	54,813	74.7	13,897	18.9	2,382	3.3	2,299	3.1	73,391	100
1932	79,824	90.3	3,086	3.5	3,083	3.5	2,398	2.7	88,391	100
1931	74,025	84.7	4,500	5.1	5,232	6.0	3,638	4.2	87,395	100
1930	46,045	72.3	10,456	16.4	3,114	4.9	4,102	6.4	63,717	100
1929	63,679	79.2	10,004	12.4	2,177	2.7	4,575	5.7	80,435	100
Average 1924-1928	*61,655*	*76.1*	*10,004*	*12.3*	*1,866*	*2.3*	*7,515*	*9.3*	*81,040*	*100*

(1) Calculated data.

In the fifteen years 1924 to 1938, world linseed exports, although they registered some marked differences from year to year especially on account of the variations of Argentine harvests, had averaged about 44,000,000 centals (78,000,000 bushels). In 1940 there had been a slump of about 50 per cent in comparison with this average, due mostly to the weak Argentine crop of 1939-40 and partly to the disorder occasioned by the war on the international market. In 1941 and 1942 world exports felt more heavily the effects of war conditions and the huge surpluses in Argentina and in the other two large exporting countries whose production could be sold only in part.

Argentine exports in 1941 were limited to only 14,330,000 centals (25,649,000), an extremely low level which meant a reduction of 57 per cent as compared with the average for the years 1935 to 1939, and of 13 per cent as compared with the year before which had registered the lowest export in the period after the war. In 1942 the slump of exports was even greater. In the first 11 months, exports amounted to 7,055,000 centals (12,598,000) with a monthly average of about 661,000 centals (1,181,000) while in the years 1935 to 1939 the monthly average had been over 2,646,000 (4,724,000).

Argentina, which in normal times exported each year its entire surplus stocks, in the last two years has seen the huge quantities of unsold stocks accumulate in its storehouses. According to an official estimate, the stocks existing in the country at December 1 1942, amounted to about 38,360,000 centals (68,501,000 bushels), against 18,739,000 (33,463,000) at the same date the year before. By estimating the exportable surplus of the present season at 30,865,000 (55,116,000) in 1943 available exportable surpluses in Argentina will amount to 69,225,000 centals (123,617,000 bushels).

Linseed Production in and Exports from Argentina.

YEARS	PRO-DUCTION	EXPORTS					
		first quarter	second quarter	third quarter	fourth quarter	Total absolute	Total % of production
		(1,000 bushels)					
1942	62,990	...	...	...	...	(1) 12,598	...
1941	57,462	3,555	5.563	8,657	7,874	25,649	44.6
1940	39,935	16,488	7,669	1,665	3,791	29,613	74.2
Average 1935/1939	*66,711*	*20,974*	*11,858*	*12,400*	*13,946*	*59,178*	*88.7*
1939	55,510	19,802	9,972	10,547	6,260	46,581	83.9
1938	61,013	15,417	9,437	9,484	15,467	49,805	81.6
1937	77,867	26,928	15,307	12,527	16,180	70,942	93.1
1936	59,446	17,897	9,311	14,460	16,908	58,576	98.5
1935	79,721	24,826	15,263	14,984	14,913	69,986	87.8
Average 1930/1934	*68,403*	*22,123*	*12;317*	*13,707*	*13,617*	*61,764*	*90.3*
1934	62,596	21,775	8,976	10,925	12,432	54,108	86.5
1933	62,005	20,806	12,830	10,658	10,519	54,813	88.4
1932	89,067	24,046	16,106	20,779	18,893	79,824	89.6
1931	78,343	25,200	15,350	18,314	15,161	74,025	94.5
1930	50,006	18,787	8,322	7,858	11,078	46,045	92.1

(1) Exports of 11 months: January to November.

Available exportable linseed surpluses in Argentina.

	(1,000 bushels)
Stock at December 1 1942	68,501
Exportable surplus from the 1942-43 harvest	55,116
Total of available exportable stocks	123,617

This surplus supply is by 50 per cent higher than the record-export of the year 1932, and would be sufficient by itself to fully cover the world normal supply for one and a half year.

The possibilities of disposing of such huge surplus quantities at the present time are extremely few, because Europe which before the war absorbed as a rule over 2/3 of world exports, is now practically cut out of the overseas exporting centers. One might count on an increase of imports into the United Kingdom, which in normal times absorbed almost 1/5 of the total European imports. A very high import level might be reached, seeing the large use of linseed in war industries; but British demand as well as that of the neutral countries feels heavily the effect of war risks and of the scarcity of tonnage.

Among the extra-European countries that could absorb an ever increasing amount of linseed may be mentioned the United States, which normally stood

United States Imports of Linseed, Tung Oil and Perilla Oil.

YEARS	Linseed	Tung oil	Perilla oil
	1,000 bushels	1,000 lb.	1,000 lb.
1941	(1) 11,362	(2) 15,873	(2) 3,968
1940	11,862	97,004	11,244
1939	16,027	78,718	51,284
Average 1934-1938	*18,102*	*129,456*	*58,158*
1938	15,366	107,365	31,747
1937	28,030	174,827	43,652
1936	15,366	134,923	117,948
1935	17,578	120,152	72,312
1934	14,169	110,011	25,133
Average 1929-1933	*14,625*	*104,059*	*13,448*
Average 1924-1928	*19,011*	*93,035*	—

(1) Nine months. — (2) Six months.

first in the import of this oleagineous product. Their imports registered considerable differences from year to year, according to the volume of their own production. During the last ten years before the war, the imports into the United States varied between a minimum of 4,409,000 centals (7,874,000 bushels) in 1932 and a maximum of 15,650,000 (28,030,000) in 1937: the average was 9,000,000 (16,300,000). The few available figures for 1941 indicate that imports were considerably lower than that average, and we are justified in believing that in 1942 imports were about the same. In 1943, notwithstanding the increased needs of wai industries, a further slump of imports may be expected, both en account of large home surpluses from the exceptionally high production of this year and of the growing scarcity of maritime transportation means.

International trade in linseed, tung and perilla oils.

The international trade in linseed oil was essentially carried on between European countries; exports came almost exclusively from the continental states of Europe (the Netherlands, France, Belgium etc) and about 2/3 of them were forwaded to other states of the same continent. In 1934-1938, the Netherlands contributed an average of about 72 per cent to total exports estimated at 252 million lb. France and Belgium followed at a great distance with, respectively, 8 and 5 per cent. As since the Spring of 1940 these countries have been unable to import linseed, they have lost all possibility to export linseed oils. It is certain that the international trade in linseed oil has narrowed down to a very low level in the last two years.

The international trade in the other siccative oils, which had already considerably decreased as a consequence of the war between China and Japan, has now been practically paralysed after the entrance of the United States in the conflict. The United States, in fact, represented the biggest market for tung and perilla oils from the Far East.

CURRENT INFORMATION ON COTTON.

Brazil: According to press information, the drought has done some damage to the cotton crop in the cotton producing States of the South. In some spots, cotton will have to be sown again.

United States: According to the December cotton Report, cotton production is now officially estimated at 12,981,000 bales of 478 lb. net weight (500 lb. gross weight), *i. e* 347,000 bales less than the November estimate (13,328,000 bales). The final estimate of production in 1941 amounts to 10,744,000 bales and the average of the 5-year period 1936-40 is 13,534,000 bales, consequently, the December estimate is larger by 20.8 per cent. in comparison with last year figure, but in comparison with the average it is 4.1 per cent. smaller. The heavy reduction of the estimate during November is officially attributed to unfavourable weather conditions, boll-weevil activity, and shortage of labour.

Egypt: The first estimate on cotton production in 1942 issued as usual the first Monday of October by the Ministry of Agriculture, has been revised in November and notably increased, amounting non to 777,900 bales of 478 lb. net weight, exclusive of *scarto*. Production is distributed as follows: 162,700 bales of Giza 7 and 233,500 bales of other long staple varieties including Sakellaridis; 7,000 bales of long-medium staple varieties, and 374,700 bales of Ashmuni and Zagora varieties. October estimate amounted to 720,900 bales.

The final estimate of 1941 production has been revised and increased to 1,700,000 bales, by adding 28,900 bales to the previous estimate. The average of the preceding 5-year period 1936-40 is 1,922,400 bales. The expected production of 1942 would be then 44.2 per cent. below that of 1941 and 59,5 per cent below the average; while, as concerns the average unit yield, the situation is reversed because in 1942 the expected yield per acre amounts to about 500 lb. of lint, against 476 in 1941, and 503 lb. on the average from 1936 to 1940.

The yield per acre of 1942 is much larger than was expected. This is explained by the fact that farmers, by following the law which restricts drastically cotton cultivation, have destined to cotton only their best lands giving the crop most of their cares and manures.

Another fact which must be noted is that the proportion of Giza 7 cotton in the total production of long staple varieties has widely decreased. This fact is mainly attributed to the increasing expansion of the new varieties, which begun to be introduced on large scale before the war.

CURRENT INFORMATION ON OTHER PRODUCTS.

Colza and sesame.

Hungary: Owing to the drought in the month of September, the seeds of winter colza have sprouted very irregularly. In some spots it has been necessary to plow over again the soil destined to this crop.

Slovakia: It was the intention of agricultural authorities to increase this year the area under colza from 1,800 to 11,600 acres. But the area actually sown to this crop has been 3,900 acres.

Sunflower.

Slovakia: It is expected that in the next Spring, the area under sunflower will be increased from 7,800 to 26,000 acres.

CURRENT INFORMATION ON FODDER CROPS.

Denmark: Yields of the main fodder crops in 1942 compared with those of 1941 and the five preceding years'average are as follows.

	1942	1941	Average 1936-40	% 1942: 1941 = 100	% 1942: Average = 100
			(thousand centals)		
Kohrabi	243,832	250,439	253,642	97.4	96.1
Mangolds	109,791	133,177	199,552	82.4	55.0
Turneps	9,700	10,044	13,895	96.6	69.8
Permanent meadows (hay)	3,968	5,470	9,856	72.6	40.3
Artificially sown grasses (hay)	14,551	14,176	30,592	102.6	47.6
			(thousand bushels)		
Kohrabi	12,191	12,522	12,682	97.4	96.1
Mangolds	5,489	6,659	9,977	82.4	55.0
Turneps	485	502	695	96.6	69.8
Permanent meadows (hay)	198	273	493	72.6	40.3
Artificially sown grasses (hay)	728	709	1,530	102.6	47.6

Hungary: The seeds of incarnat clover were practically lost on account of the great drought of last September. More or less extended parts of the soil that had been sown to this crop, had to be plowed over again.

Romania: The Ministry of Agriculture is actively pursuing its action for the intensification of sowings of fodder plants over part of the pastures. At the beginning of November, the work of clearing and plowing on pasture lands had done good progress.

Slovakia: Owing to the drought, the production of forage crops has been lower than last year.

Argentina: In November the condition of pastures was average.

LIVESTOCK AND DERIVATIVES

PIGS IN DENMARK *).

(Thousand head)

Classification	1942 Nov. 14	1942 Oct. 3.	1942 Aug. 22	1942 July 11	1942 June 13	1942 May 2	1942 March 21	1942 Feb. 7	1941 Dec. 27	1941 Nov. 15
Boars for breeding . . .	9	9	8	9	8	8	8	8	9	9
Sows in farrow for first time	49	55	56	61	48	37	27	20	23	28
Other sows in farrow .	69	66	64	64	63	61	60	67	69	68
Sows in milk	47	44	40	30	31	32	30	34	42	50
Sows not yet covered (and not for slaughter)	18	20	16	13	14	13	19	20	22	27
Sows for slaughter. . .	10	9	5	4	5	5	9	11	16	21
Total sows . . .	*193*	*194*	*181*	*172*	*161*	*148*	*145*	*152*	*172*	*194*
Sucking pigs not weaned	385	377	337	253	251	256	229	246	326	398
Young and adult pigs for slaughter:										
Weaned pigs under 35 kg.	384	326	280	286	283	270	329	409	513	534
Pigs of 35 and under 60 kg.	298	293	305	295	257	276	327	387	424	416
Fat pigs of 60 kg. and over	400	394	272	191	194	204	229	266	247	374
Total pigs . . .	*1,669*	*1,593*	*1,383*	*1,206*	*1,154*	*1,162*	*1,267*	*1,468*	*1,691*	*1,925*

*) Rural districts only.

CURRENT INFORMATION ON LIVESTOCK AND DERIVATIVES.

Hungary: About December 7, the health condition of livestock was generally satisfactory in spite of the weakness of the animals due to the scarcity of fodder.

CURRENT INFORMATION ON SERICULTURE.

Rumania: The Ministry of Agriculture, in agreement with the Ministry of the Interior and of National Education, has taken rigorous measures for the intensification of sericulture, especially in the regions where mulberry trees are growing. The Chambers of Agriculture will distribute among farmers about 700 kg. of silkworm eggs for incubation.

TRADE

GREECE: Imports.

Wheat imports in the month of June 1942 amounted to 247,646 centals (412,735 bushels of 60 lb) and wheat flour to 683 centals (349 barrels of 196 lb).

PORTUGAL

Products and Units	October				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1942	1941	1942	1941	1941-42 1942 or 1942-43	1940-41 1941 or 1941-42	1941-42 1942 or 1942-43	1940-41 1941 or 1941-42	1940-41 1941 or 1941-42	1940-41 1941 or 1941-42
Wheat: 1,000 centals	0	0	39	39	0	0	512	919	0	3,117
» : Thous. bush. of 60 lb.	0	0	65	65	0	0	854	1,532	0	5,195
Wheat flour: 1,000 centals	0	0	0	1	0	0	0	2	4	10
Wheat flour: Thous. bbl. of 196 lb.	0	0	0	0	0	0	0	1	2	5
Maize: 1,000 centals	0	0	163	93	0	9	1,260	1,742	9	1,742
» : Thous. bush. of 56 lb.	0	0	291	165	0	17	2,251	3,111	17	3,111
Rice: 1,000 centals	0	0	9	19	0	38	19	80	38	86
» : Thous. bush. of 45 lb.	0	0	19	42	0	84	42	178	84	191
Linseed: 1,000 centals	0	0	0	0	0	0	0	11	0	11
» : Thous. bush. of 56 lb.	0	0	0	0	0	0	0	19	0	19
Cotton: 1,000 centals	0	0	34	75	0	0	86	153	0	586
» : Thous. bales of 478 lb.	0	0	7	16	0	0	18	32	0	123
Wool: 1,000 lb.	0	0	123	9	0	0	187	9	0	884
Butter: » »	20	40	0	0	260	262	0	0	313	0
Cheese: » »	20	18	0	0	287	256	0	37	317	37
Cacao: » »	0	0	18	192	0	0	18	192	4	1,400
Tea: » »	0	0	49	11	15	0	95	121	0	379
Coffee: » »	2	15	1,504	465	4	256	3,023	1,680	284	9,094

SWEDEN: Imports.

Products and Units		October		Total from the beginning of the season *)		Total of the season *)
		1942	1941	1942-43	1941-42	1941-42
Wheat	1,000 centals	86	0	513	0	781
»	Thous. bush. of 60 lb.	144	0	855	1	1,302
Rye	1,000 centals	0	0	8	0	286
»	Thous. bush. of 56 lb.	0	0	14	0	511
Oats	1,000 centals	0	15	33	48	163
»	Thous. bush. of 32 lb.	0	48	103	150	511

*) Season beginning January 1st for rice, linseed, butter and cheese; July 1st for tea and coffee; August 1st for wheat wheat flour, rye, oats and cotton; September 1st for wool; October 1st for cacao; November 1st for maize.

CHILI : January 1st-June 30, 1942 and 1941.

Products and Units	Exports 1942	Exports 1941	Imports 1942	Imports 1941
Wheat flour . . . 1,000 centals	—	—	50	55
» » . . . Thous. bbl. of 196 lb.	—	—	25	28
Oats . . . 1,000 centals	23	9	—	—
» . . . Thous. bush. of 32 lb.	71	30	—	—
Cotton . . . 1,000 centals	—	—	117	51
» . . . Thous. bales of 478 lb.	—	—	25	11
Wool (1) . . . 1,000 lb.	14,467	10,540	664	161
Cacao . . . » »	—	—	1,612	1,175
Tea . . . » »	—	—	1,770	1,713
Coffee . . . » »	—	—	7,791	5,891

(1) Exports of wool during the month of september 1942 amounted to 364 Thousand lb.

PERU

Products and Units	October				Total from the beginning of the season *)				Season: Total for Twelve Months *)	
	Exports		Imports		Exports		Imports		Exports	Imports
	1941	1940	1941	1940	1940-41 1941 or 1941-42	1939-40 1940 or 1940-41	1940-41 1941 or 1941-42	1939-40 1940 or 1940-41	1939-40 1940 or 1940-41	1939-40 1940 or 1940-41
Wheat: 1,000 centals	0	0	476	0	0	0	1,183	1,123	0	2,340
» : Thous bush. of 60 lb.	0	0	793	0	0	0	1,972	1,871	0	3,901
Wheat flour: 1,000 centals	0	0	4	2	0	0	9	8	0	36
Wheat flour: Thous. bbl. of 196 lb.	0	0	2	1	0	0	5	4	0	18
Oats: 1,000 centals	—	—	5	0	—	—	7	22	—	42
» : Thous bush. of 32 lb.	—	—	17	1	—	—	23	69	—	130
Maize: 1,000 centals	0	0	0	0	1	0	0	11	0	11
» : Thous. bush. of 56 lb.	1	0	0	0	2	0	1	20	0	20
Rice: 1,000 centals	1	0	3	35	2	0	77	196	0	248
» : Thous. bush. of 45 lb.	2	0	6	79	4	0	172	436	0	552
Cotton: 1,000 centals	126	110	—	—	540	285	—	—	1,590	—
» : Thous bales of 478 lb.	26	23	—	—	113	60	—	—	333	—
Wool : 1,000 lb.	1,153	1,638	—	—	2,496	1,889	—	—	13,799	—
Butter: » »	0	0	35	29	0	0	238	172	0	223
Cheese: » »	0	0	115	46	0	0	578	322	0	408
Cacao: » »	—	—	15	46	—	—	15	46	—	891
Tea: » »	0	0	220	139	0	0	659	747	0	1,422
Coffee: » »	721	236	0	0	3,353	547	0	0	4,407	0

*) See note page 446.

PRICES

PRICES BY PRODUCTS. — Quotations for future delivery.

Description	Dec. 18, 1942	Dec. 11, 1942	Dec. 4, 1942	Nov. 27, 1942	Nov. 20, 1942	Monthly averages: Nov. 1942	Dec. 1941	Dec. 1940	Dec. 1939	Dec. 1938
Wheat.										
Winnipeg (cents p. 60 lb.):										
delivery December	90	90	90	90 1/4	90 3/8	90 3/8	74 1/4	73 1/8	81 1/2	60 5/8
,, May	93 3/4	93 7/8	93 7/8	—	—	—	77 7/8	76 7/8	85 1/2	62 1/2
,, July	—	—	—	—	—	—	79 1/8	78 5/8	86 1/2	63 1/4
Chicago (cents. p. 60 lb):										
delivery December	135 1/2	130 5/8	127 1/8	125 1/4	124 7/8	125 1/2 *	122 3/8 *	89 1/8	100 1/2 *	63 5/8
,, May	136	132 2/8	130 7/8	129 1/2	128 3/4	128 5/8	126 1/8	85 1/4	98 3/4	67 1/8
,, July	136 1/2	133 1/4	131 3/8	130 1/8	129 1/4	129 1/8	126 3/4	80 1/4	96 3/4	67
,, Septembre	137 5/8	134 1/4	—	—	—	—	—	—	—	—
Rye.										
Winnipeg (cents p. 56 lb.):										
delivery December	64 1/8	64 1/2	63	60 3/4	58 3/8	58 1/4	59 1/2	45 7/8	72	39 7/8
,, May	65 3/4	65 3/4	64 5/8	62 3/4	60 5/8	60 5/8	62 1/2	48 7/8	74 3/8	41 3/4
,, July	66 1/2	—	65 3/4	—	—	—	63	49 3/4	73 5/8	42 1/4
Chicago (cents p. 56 lb.):										
delivery December	72 1/8	70	68 1/8	65	62 1/4	62 3/4 *	67 *	42 7/8 *	62 1/8 *	41 3/8
,, May	76 1/2	75	74	71 5/8	68 1/4	68 3/4	73 3/8	46 3/4	67 1/4	45 1/4
,, July	78 3/4	77 3/8	76	73 1/4	70 1/2	70 7/8	75 1/2	47 3/4	66 1/8	45 1/2
Barley.										
Winnipeg (cents p. 48 lb.):										
delivery December	60 7/8	60	60	60	60 1/4	60 1/4	59 3/4	43 3/8	49	37 7/8
,, May	62 7/8	62 3/8	62 3/4	62 5/8	63	63	60 1/8	44	50 1/2	38 5/8
,, July	—	—	—	—	—	—	59 1/8	42 1/8	49 3/4	37 7/8
Oats.										
Winnipeg (cents p. 34 lb.):										
delivery December	45 1/4	45	45	45	45 3/4	45 3/8	47 7/8	32 3/4	38 1/8	28 1/2
,, May	48 1/4	47 3/8	47 3/4	47 5/8	47 3/4	47 3/4	46 3/4	32 3/8	38	29
,, July	48 5/8	48 1/4	48 5/8	—	—	—	46	31 1/8	37 3/4	28 5/8
Chicago (cents p. 32 lb.):										
delivery December	52	51 5/8	50 7/8	50 1/4	49 3/4	50 3/4 *	52 *	38 7/8 *	39 3/4 *	27 5/8
,, May	53 7/8	53 1/8	53	53 1/8	52 3/4	53 1/4	55 3/4	35 5/8	38 1/4	28 5/8
,, July	53 3/8	53 1/8	52 3/4	53 1/8	52 3/4	52 7/8	54 1/4	31 7/8	34	27 5/8
Maize.										
Chicago (cents p. 56 lb.):										
delivery December	88 1/8	87 3/8	86 3/4	83 5/8	83	83 1/4 *	77 3/4 *	60 1/8 *	54 1/4 *	49 1/4
,, May	92	91 1/8	90 3/4	88 3/4	83	88 1/4	83 3/8	60 3/8	56 5/8	52 1/4
,, July	92 3/4	92 1/4	91 7/8	90 3/8	89 5/8	89 7/8	84 7/8	60 3/8	56 7/8	53 1/8
,, Septembre	93 5/8	92 3/4	—	—	—	—	—	—	—	—
Linseed.										
Winnipeg (cents per 56 lb.):										
delivery December	164	164	164	164	164	164	155 5/8	130 3/4	176 5/8	144 1/8
,, May	—	—	—	—	—	—	158 7/8	134 7/8	180 3/8	140 7/8
,, Juillet	—	—	—	—	—	—	159 1/4	136 1/8	179 3/8	—

* Indicates that the product was not quoted during part of the period under review.

Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

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THE PROBLEM OF INCREASE IN VITAMIN CONTENT OF AGRICULTURAL PRODUCTS IN VIEW OF IMPROVING THE DIET OF THE PEOPLE

Prof. E. LELESZ

SUMMARY: Introductory — I. Decisive changes in the conception of diet — II. Increase in vitamin requirements and search for new sources of these principles — III. Choice and intensified cultivation of plants rich in vitamins — IV. Factors which influence the vitamin content of agricultural products — V. Artificial enrichment in vitamin content of food products — VI. Transformation of food products and conservation of vitamins — VII. Control of foodstuffs and international conventions.

A very important task in modern agriculture and industry is the enrichment of foodstuffs in vitamins and the adequate preservation of these principles. It is necessary to know not only vitamin requirements of man, but also to what extent the quantity of vitamins in products varies in correlation with the different factors which influence it. The search and application of new methods for the improvement of foodstuffs should be, for all degrees of production and transformation, a question of principle; a joint endeavour for quality. The vitamin content of agricultural products may be influenced decisively. Its control, official or private, in the case of food products and preserved foodstuffs, appears more and more indispensable, for instance the repression of fraudulent practices, and, should be the object of new laws and international conventions.

Introductory

Every war brings about decisive changes in the economic life of the different peoples and obliges them to effect profond modifications and restrictions, and more than one country has been bound to world economy, namely, the more it depended on the international exchange for its demands and requirements, the greater the changes. The realization of the economic independence of a nation is self-sufficiency. A country feels the necessity of autarchy as the farmer seeks after polyculture, and in the management of enterprises is felt the utility of rendering production more complete. Therefore, the tendency is to develop every possibility of producing the raw materials which are wanting or only available in insufficient quantities.

Thus, agricultural production is fundamental. A country which produces with a view to realizing self-sufficiency should encourage research work, promote discoveries and their improvement, also in regard to the vitamin content of agricultural products.

The diet of a people is based, in most cases, on the agricultural production of its country, this in turn depends on the nature of the soil and climate, as well as on work capacity, practices, etc. If certain prononced deficiencies are found in the diet of a people, it is often necessary to consider making decisive changes in agricultural production. Changes of this kind, however, are generally difficult and slow to realize. The outcome is the possibility of improving the state of nutrition, the quality of agricultural products and, in particular, their content in ' protective ' substances, which have a very appreciable practical importance.

I. Decisive changes in the conception of diet

The progress of the science of vitaminology has demonstrated that the deficiency in ' protective ' substances may provoke in an organism, within a relatively short time, very serious disorders, while a reduction in the intake of heat-producing foods, if not too pronounced, does not have this effect. Therefore, particular attention should be given to ' preventive ' nutrition, as the insufficiency of protective substances is not manifested in the same way as the want of energizing principles, which is expressed by a definite feeling of hunger. It is evident that the diet should first of all furnish the necessary minimum of calories, and this minimum is relatively lower if the ration is well balanced. The requirements of the human organism in non-energizing principles are minimum in comparison with the enormous quantity of heat producing substances needed. Although quantitatively small, however, the contribution of vitamins is no less imperious. The absence or deficiency of vitamins in the diet leads to organic disorders known as ' avitaminoses ' and ' provitaminoses ' or ' hypovitaminoses '.

The chief creator and revealer of these disorders is war: owing to restrictions in natural foods rich in vitamins which are the surest guarantee of a good physiological condition of the individual, because of the very low intake of fats and, consequently of liposoluble vitamins, the relatively high consumption of substitutes and preserved foods, not always prepared with a view to retaining their natural vitamin content, the high cost of many essential products, aggravating the meagre resources of a very large proportion of the people. War unquestionably occasions vitamin deficiency and, therefore, different pathological conditions. Thus the question of quantity of food should frequently make way for that of the chemical composition and quality of food.

II. Increase in vitamin requirements and search for new sources of these principles

The knowledge of the extent of the vitamin requirements of man is indispensable for watching the diet and balancing it as well as possible. An exact determination, however, is not easy. Many factors intervene which modify these requirements: age, sex, diet, indisposition, etc.

The requirements of a young organism in full development, those of an adult, those of an old man, are not the same. The organism of a woman has its own special exigencies, especially during pregnancy and nursing.

There is no vitamin exigency in itself, independent of everything else which composes the alimentation, on the contrary, there is a close correlation between all the elements of the diet (for example: more or less large quantity of carbohydrate aliments) and this may modify the vitamin requirements. Certain diseases such as diabetes, obesity, rachitis or haemophilia, will necessitate amounts of vitamins different from the usual doses.

In regard to vitamin A, the most recent studies (JAVILLIER) have proved that a man of average weight, with a normal diet and per day, requires approximately 5,000 International Units of this principle, representing 2 mg. of carotene and 0.5 mg. of vitamin A properly so called. One International Unit (I. U.) corresponds to the amount of vitamin A activity contained in 0.6 γ β-carotene. Two milligrams of carotene = 3,333 I. U. As for ½ mg. of the vitamin properly so called, if an activity double that of carotene, namely 0.3 γ, is attributed to it, its physiological activity is equivalent to that of 0.6 γ of carotene and represents in fact 1,666 I. U. + 3,333 I. U. = approximately 5,000 I. U.

Naturally the figures will vary according to the ratio established between the carotene activity and the vitamin activity. It is recognized, in fact, between 0.22 γ and 0.30 γ of vitamin are required to equal 0.6 γ of carotene.

In the case of a child receiving a normal varied diet, requirements are covered by ¼ mg. of the vitamin itself, plus 1 mg. of provitaminic carotenoïds.

Cow' s milk has a slightly lower vitamin content than human milk, the change from the milk of the nursing mother to cow's milk is accompanied by an appreciable decrease in the ingestion by the infant of vitamin A, which loss has to be compensated.

The disorders caused through deficiency in vitamin A are more or less serious according to the degree of this deficiency. Vitamin A is indispensable for growth. Its deficiency produces xerophthalmia (drying-up of the cornea), a certain dryness of the skin, irritability, digestive disorders, a diminution in the ability to distinguish objects in the dark (hemeralopia), etc.

Vitamin A is also anti-infectious, between the daily minimum necessary to prevent symptoms of avitaminosis and the protective dose, rendering the human organism less susceptible to colds and infections of the sinus, there is a wide margin.

The human organism is assured its daily ration of vitamins through vegetable foods supplying the provitamin in the form of carotene in carrots, spinach, etc. or of cryptoxanthene in capsicums, etc. The plants of tropical countries contain rather cryptoxanthene, which does not appear to be so easily transformed into vitamin A, than carotene, abundant in the plants of temperate lands. Vitamin A is also furnished to the organism through animal foods, in particular, eggs, butter or through the ingestion of fish liver oil or by synthetic preparations of this vitamin.

Vitamin A is only found in the proformed state in foods of animal origin (cod liver oil, liver, egg yolk). Plants only contain provitamins A, colouring substances belonging to the group of carotenoids (carotene, xanthophyll, lycopin), the active principle of which is carotene; this is a red pigment which ac-

companies the chlorophyll in the plant tissues, the xanthophyll (yellow pigment) also occurs with these, when the chlorophyll disappears, the carotene and xanthophyll subsist alone (this explains the various yellow and red colouring the autumn leaves and ripe fruits acquire).

The organism only transforms into vitamin A about 1/5 of the quantity of carotene absorbed, this proportion varies according to individual. In general, a part of the carotenoids absorbed is accumulated in the adipose tissue. Man accumulates all carotenoids, cattle and horses only store up the carotenes (this is why their fat is yellow and yellow orange in colour), the Gallinaceae only accumulate xanthophyll (their fat is also yellow), pigs do not accumulate any carotenoid in their fat which is white.

In man, the transformation of carotenoids in vitamin A takes place in the liver and is more or less easy, principally according to the condition of this vital organ (especially according to the state of the reticulo-endothelial system).

The carotenoids also accompany vitamin C in green vegetables and coloured fruits.

Vegetables, consumed raw, supply an appreciable quantity of carotene without modification, however, care must be taken to eat them as fresh as possible, as their vitamin content decreases with time.

Vitamin A properly so called is found in large quantities in fish liver oil, liver, fat meats, etc. Cod liver oil is one of the best sources of vitamin A; the active substance is found in the non-saponifiable fractions of the oil. Today, vitamin A is not found in abundance in the food diet, as animal fats are now rationed practically the whole world over. This vitamin, however, is also found in the proteins and consequently remains in skim milk and in skim milk cheese.

People of white races depend largely on milk products and eggs as sources of vitamin A. The cows obtain the vitamin A, which they accumulate in their organs or which they excrete in the milk, in the form of carotene in the green pasturage and in the form of cryptoxanthene and carotene in forage.

The value of butter as a potential source of vitamin A is partly due to the content in this vitamin and partly to the carotene content: the animal may utilize the carotene in place of vitamin A or else transform it into vitamin A.

If it is a question of eggs as a source of vitamin A, the laying hens should have an appreciable excess of vitamin A, in the form of carotene, in their ration, over above the requirements of their own organisms; if there is not enough in their ration, they lay less eggs. These eggs poor in vitamin A do not allow the normal development of the chicks, which suffer from infections of the gullet and the eyes, and their growth is checked. As a food, these eggs no longer represent a source of vitamin A for man, like those laid by hens having a diet rich in carotene.

The hen makes available for human nourishment 25 per cent. of the provitamin ingested: to 4 units furnished by the ration correspond one unit in the egg laid.

One of the most abundant sources of provitamin A is found in carrots. According to SCHUPHAN, in 100 gm. of fresh matter they contain on an average 10 mg. of carotene, while spinach contains 5.56 mg., tomatoes 0.66 mg., salad 0.44 mg., there are only traces of provitamin A in white-heart cabbage.

SCHUPHAN found, for different varieties of carrots, variations in carotene content of 6.5 to 14 mg. per 100 gm. of raw product.

Early harvesting of carrots (beginning of June) gives less carotene than late harvesting (autumn) of the same variety. SCHUPHAN points out that the crop of a hectare of carrots, for example, of the ' Longue rouge sans coeur ' variety, contains a quantity of carotene which may meet the requirements in vitamin A of 961, 600 individuals, while the crop of a hectare of the ' Nantaise ' variety may only suffice for the needs of 646,700 persons (calculating 5 mg. of carotene per man per day).

The largest quantity of carotene is found in the outer part of the carrot. SCHUPHAN asserts that there is no relation between the quantity of carotene and the intense colouring of carrots, it is not accurate to consider that this colouring indicates the more or less pronounced existence of provitamin.

A good source of provitamin is to be found in nettle leaves, 100 kg. of which may furnish from 3.1 to 3.5 gm. of pure carotene.

Vitamin B_1 (aneurin or thiamin) plays a dominant role as a protective and equilibrating factor of the nervous system. The data on the extent of vitamin B_1 requirements are not entirely coherent. It is important to note that the necessary dose of vitamin B_1 depends to a great degree on the carbohydrate ration. Thus the effective amount of this vitamin must be calculated according to the quantity of digestible carbohydrates in the diet. COWGILL considers that the optimum dose of vitamin B_1 is half the energizing value of the ration, expressed in calories. For example, for a ration of 2,400 calories, the effectual dose is 1,200 γ. According to other investigators, an adult man requires 1 to 2 mg., that is 333 to 666 I. U. of vitamin B_1 per day.

Vitamin B_1 is found in relatively large quantities in brewer's yeast and in seeds, in the latter, chiefly in the germs and peripheral parts, which are detached on milling in the form of bran, fact which explains the importance of bran in stock-feeding.

Vitamin B_2, hydrosoluble, is a vitamin essential for growth. It is much more resistant than the former to oxidation and heat. It is also much more widespread in vegetable and animal foods. Vitamin B_2 has been identified as a hydrosoluble green fluorescent pigment, called flavine, which is found in whey (lactoflavin), in eggs (ovoflavin), in vegetables, tomatoes, fruit juices, the muscles, the kidneys, etc. Pure lactoflavin, formula $C_{17}H_{20}O_6N_4$, is the most active of the vitamin B_2 preparations attained to date, it acts, in the same way as vitamins A and B_1, as a growth factor. Vitamins A, B_1 and B_2 are necessary for the adult; an adequate amount of these vitamins in children's diet is indispensable.

The requirements of man in vitamin B_2 have not been the subject of any considerable direct experimentation, for this reason investigators agree in estimating them at 1-1.5 mg. and even as much as 3 mg. per day. Dried legumes (beans, lentils, peas), milk and eggs are good sources of this vitamin.

Vitamin B_6, or adermin, appears to be of real importance to the human species. Cases of cheilosis have been cured by vitamin B_6 or by foods containing this vitamin (yeasts, liver, fish muscles, etc.). The doses of this

antidermatic vitamin which have been employed therapeutically are from 1 to 2.5 gm. per day.

The anti-pellagra vitamin, P-P factor, is the specific remedy of pellagra; it is the same vitamin which prevents or cures black tongue disease in dogs and hog pellagra, diseases very similar to the first.

In the case of man, effective doses have been determined for typical pellagra and a syndrome comprising: anorescia, glossitis and digestive troubles, cutaneous lesions, mental disorders and porphyrinuria.

It is difficult to establish a common dosage of these vitamins sufficient to play a preventive role. It would appear to be from 0.05 to 0.1 gm. per day.

It is chiefly meat which supplies the P-P vitamin in alimentation, yeasts or their extracts are the most wholesome means of radically increasing the intake of this essential factor.

Vitamin C, or ascorbutic vitamin (ascorbic acid) differs from other vitamins by the percentage of the quantities required. It is generally recognized that the quantity of this vitamin necessary for the human adult organism is round about 1 mg. per kg. weight per day (GOETHLIN, BEZSSONOFF and VAN WIEN, HANKE). ABBASY, HARRIS and MARRACK fix it at 25 mg. per day, VAN ECKLEN and HEINEMANN at approximately 0.84 mg. per kg. weight. Requirements are slightly higher during pregnancy and gestation (NEUWEILER, BAUMANN and RAPPOLT). As regards infants, it is estimated that 2 mg. per kg. weight are required and the opinion for the moment is that this dose necessary for an infant after the first year gradually diminishes with growth.

If, in the light of this figure, the way in which civilized people feed themselves is considered, it appears evident that large populations live in a more or less pronounced state of vitamin C deficiency.

A good food ration should comprise 50 mg. ascorbic acid per day, this acid should be relatively pure, condition indispensable for stability. Experiments showed that an organism abundantly supplied with ascorbic acid possessed a high degree of resistance to influenza and catarrhal infections, lassitude, so frequent in winter, disappeared, and fragility of the skin was greatly lessened.

A people having an adequate intake of ascorbic acid, therefore, will be able to furnish a much greater work output than an inadequately nourished people, common diseases will be much less frequent, mishaps rare and less serious.

The individual, like the mass of the people, cannot but gain from a diet containing ascorbic acid in abundance.

Ascorbic acid ($C_6 H_8 O_6$) is like the sugars: it is a substance which man should always have in his food. Many species of animals, however, can dispense with outside sources of ascorbic acid as they are capable af producing the necessary principles themselves.

According to the most recent studies of ROHMER and BEZSSONOFF, the faculty of synthesis exists in man for the first ten months of life, it tends to diminish towards eleven months and seems to be lost after the 1st year. The healthy and normally built young infant is able to synthesize vitamin C itself.

Vitamin D (antirachitic). — It is known that rachitis or rickets is a disease characterized by disorders in osteogenesis and delay in bone calcification

which is manifested chiefly by incurvation of the vetrebral columun and other osseous malformations.

The need for vitamin D depends on the mode of living of the individual: life in the open air and in the sun or, on the other hand, a more or less closely confined life. According to the different cases, the requirements in vitamins of alimentary origin vary considerably. The child who leads a hygienic life and whose skin receives luminous rays in abundance, transforms the activable sterols of the teguments into vitamin D, it is the light which is the cause of this transformation.

The protective dose varies between 3,5 and 20 γ per 24 hours, sometimes even up to about 40 γ; in most cases, however, it is round about 10 γ, this is a protective dose for a child whose diet is not preposterously unbalanced.

It is understood that the curative dose would be much higher: 5 times and even over. Therefore it is chiefly to the young that the necessary quantities of vitamin D should be supplied (the protective dose before the curative dose).

This vitamin is found, principally in the form of provitamin (ergosterol or ergosterin: C_{27} H_{44} O), in the buds and young leaves of plants, under the influence of the ultra-violet rays of the sun, the ergosterol accumulated in the skin of animals is transformed into calciferol (vitamin D_2 = C_{28} H_{48} OH), the chemical synthesis of which was effected in 1936.

The vitamin D content of milk depends on the proportion of this vitamin in the forage consumed by the milch cows, except during the pasturage period, when under the influence of the solar rays, vitamin D is formed in the skin fo the dairy animals.

V i t a m i n E, or v i t a m i n o f r e p r o d u c t i o n, (α-tocopherol = C_{29} H_{50} O_2). — This is indispensable in the elaboration of the male sexual cells and the nutrition of the foetus. It is of considerable physiological importance, as its absence in the diet causes sterility. In human pathology, morbid manifestations are known and are ascribable to avitaminosis E.

The adult man requires 1 to 5 mg. of this vitamin per day. It is calculated that, for pregnant women, the effectual dose is 250 mg. for the entire period of pregnancy, in other words, about 1 mg. per day, maximum dose: 1-2 mg. of tocopherol.

Vitamin E is found chiefly in wheat germs or sprouts, walnuts, hazelnuts, cress, lettuces, dandelions and the different vegetable oils.

V i t a m i n K (a n t i - h e m o r r h a g i c). — This vitamin renders the coagubility of the blood normal. Therefore its importance is very great. It has a double source, foods and the intestinal bacteria which can synthesize it. Contrary to vitamin E, it is not accumulated by the organism, so that the supply has to be frequently renewed. The requirements of man in this vitamin would amount to one milligram (approximately 50,000 prophylactic units per day).

Among the other vitamins necessary to the human organism, mention may be made of: v i t a m in P, as it concerns, like vitamin K, the circulatory system, v i t a m i n H, indispensable for the skin (against *status seborrhoicus*), v i t a - m i n B_x, the deficiency of which causes greying of the hair.

The role of these latter vitamins is certainly important, but it would be premature to indicate the physiological proportion advantageous for man.

III. Choice and intensified cultivation of plants rich in vitamins

The distribution of vitamins in plants, the selection and intensification of new crops, are questions of great and actual importance in practice. This is why they have held the attention of many investigators.

Vegetable foods present appreciable differences as regards content in vitamin C. The leaves and certain types of fruits contain a high proportion, while the roots and other vegetal parts, including many fruits, only comprise fairly small amounts.

Von Auler and Klussmann, but especially Bessey and King, have reported that the green tissues of plants are rich in vitamin C, in these tissues, there would seem to be a connexion between the presence of vitamin C and the chlorophyll function. According to the observations of Heller and other workers, plants grown in light would contain more ascorbic acid than etiolated plants.

Giraud, Rattsimamanga and Leblond have carried out a series of investigations on a large number of plant species with a view to ascertaining the distribution of ascorbic acid. They measured comparatively this acid according to the Tillmans method, both in the green parts (leaves, stems, etc.) and in the non-green parts (tubers, roots, etc.). The green parts contained much more ascorbic acid than the others.

Table I reproduces, according to the data of these experimenters, a series of examples chosen from among the plants commonly utilized in nutrition.

Table I. — *Amount of ascorbic acid (in mg. per 100 g. fresh matter) found in different plants*

Plants	Ascorbic acid	
	In the green parts (leaves, stems, etc.)	In the non-green parts (roots, tubers, etc.)
Celery (*Apium graveolens*)	0.58 mg.	0.06 mg.
Celeriac (*Apium graveolens* var. *rapaceum*)	0.96	0.19
Leek (*Allium porrum*)	0.66	0.04
Onion (*Allium cepa*)	0.22	0.02
Maize (*Zea mays*)	0.96	0.05
Garden lettuce (*Lactuca scariola* var. *sativa*)	0.31	0.08
Scorzonera (*Scorzonera hispanica*)	0.80	0.06
Salsify (*Tragopogon porrifolius*)	0.80	0.06
Turnip (*Brassica napus*)	1.76	0.06
Horse-radish (*Cochlearia armoracia*)	0.73	0.36
Radish (*Raphanus sativus*)	0.69	0.17
Parsnip (*Pastinaca sativa*)	0.82	0.03
Carrot (*Daucus carota*)	0.47	0.06
Cress (*Nasturtium officinale*)	1.41	0.51
Lucern (*Medicago sativa*)	2.32	0.20
Prickly lettuce (*Lactuca scariola*)	0.28	0.028
Dandelion (*Taraxacum sens-leonis*)	0.41	0.02
Artichoke (*Cynara cardunculus* var. *scolymus*)	0.14	0.10
Potato (*Solanum tuberosum*)	0.05	0.02

From the nutritional viewpoint, it is very important at present to examine in greater detail than formerly the vitamin C content of different plants. Table II furnishes, according to LÖHNER, some indications in this respect.

The experiments of VIRTANEN and other investigators show that the stage of development of the plants has a decisive influence on their vitamin content. In most plants it is in the early stages of growth (before the onset of flowering) that their carotene content is maximum. The proportion of vitamin C attains its maximum slightly later than that of carotene. When seeds start to form, the vitamin C content of the plants diminishes rapidly.

TABLE II. — *Amount of vitamin C (in mg. per 100 g.)*

Plants	Vitamin C	
	In fresh matter	In dry matter
Prunus Padus	1000-1688 mg.	2248-2640 mg.
Primrose (*Primula* sp.)	105-456	457-1760
Buckthorn (*Rhamnus cathartica*)	472-862	—
Willow (*Salix* sp.)	255-325	—
Peony (*Paeonia officinalis*)	290	—
Thalictrum sp.	220	—
Horse-radish (*Cochlearia armoracia*)	281	—
Lime-tree (*Tilia* sp.)	240	—
Arum sp.	174.8	—
Red currant (*Ribes rubrum*)	237-244	—
Scrophularia sp.	194	—
Strawberry (*Fragaria* sp.)	149	—
Lysimachia vulgaris	122	—
Rhubarb (*Rheum officinale*)	132	—
Oxalis sp.	140	—
Vincetoxicum officinale	263	—
Gooseberry (*Ribes grossularia*)	158-316	—
Garlic (*Allium* sp.)	3.4	—
Sweet-basil (*Ocimum basilicum*)	5.2	22

It is necessary today to know all sources especially rich in vitamin C.

Many investigators have reported the richness in vitamin C of certain leaves and also of some carotenoid fruits, and it is this particular richness which has made it possible to obtain, in a relatively easy manner, the concentrated extracts and subsequently the pure substance itself, from: leaves of the pitch-fir (HAHN), the pine (GRJASNOW and ALEXEIEWA), spruce (SCHEPILEWSKAJA, ORLOW, MATZKO), cabbage (BEZSSONOFF), iris (BAUMANN and METZEGER), gladiolus, chillies (SZENT-GYÖRGYI), etc.

Of all cultivated fruits, the richest in vitamin C is the sweet pepper (Bell-capsicum): 20 gm. of this fruit suffices to supply all the ascorbic acid necessary in the ration (1 kg. of fresh capsicums contains from 2-3 gm. of ascorbic acid).

Capsicums contain not only ascorbic acid but also the hydrosoluble vitamins B_1 and B_2 in not unimportant quantities, their concentration is of the same order as in the best vegetables, such as green peas. Red chillies furnish as much carotene as ascorbic acid. In view of the present importance of the question, many capsicum varieties have been subjected to a close chemical examination.

VAJIC studied the vitamin C content of chillies and their importance as a protective nutritive substance in ordinary alimentation. The vitamin C content was found to be lowest at the beginning of vegetation: May-June. Subsequently it increases continually, in autumn, it is from 46.2 to 48.96 mg. per 100 gm. According to this author, the red chillies are richer in vitamin C than the green.

TABLE III. — *Content in hydrosoluble vitamins of the principal varieties of sweet peppers.*

Varieties	Ascorbic acid in gm. per kg.	Vitamin B_1 in mg. per kg.	Vitamin B_2 in mg. per kg.
Genova Sweet	2.8	0.8	2.4
Mammoth Yellow	2.0-2.5	0.6-0.8	1.2-1.5
Colossal	2.4	0.5	2.4
China Giant	2.0	0.5	2.0
Ruby King	2.0-2.3	0.5-0.8	1.6-3.2
American Square Sweet	2.0	0.6	0.8
Spanish Sweet	1.6-2.0	0.6	0.8-2.0
Algiers Giant	1.4	1.0	2.4
Long Yellow	2.0	0.8	1.0
Monster	1.4	1.2	0.5

Capsicum ascorbic acid costs 10 times less than that from citrus plants. Contrary to the case of very large fruits of the pear and the apple which are difficult to transport and to sell, large capsicums are transported and sold just as easy as the average and small-sized pods.

From the culinary standpoint, preparations of the chilli are very varied: it can be eaten raw, in salads, and in many other different ways. It can be used as a condiment in innumerable dishes, in the same way as the tomato. The pungent chilli is also sold dried and in powder form as a seasoning. This powdered product frequently contains 1 per cent. and over of ascorbic acid. Naturally it can only be used in very small amounts in the food. It is evident that it would be just as easy to prepare sweet peppers in powder form, which could be employed in higher doses than the pungent chillies.

Professor SZENT-GYÖRGYI (who received the Nobel Prize for his discovery of ascorbic acid) attributes the robustness of the people of the Hungarian Plain to the very extensive use of paprika in their food.

In Hungary there is a Biological and Botanical Institute specialized in the study of the chilli in national alimentation.

In advocating expanding the cultivation and use of chillies we are but following the example already given by other physiologists.

The h i p , fruit of the sweetbrier or dogrose, is also very rich in vitamin C, like the fruits of most of the varieties of the rose. The vitamin C content of the fruit, that is fully red, but still hard, amounts to 500-900 mg. per 100 gm. of the edible part (seeds excluded). These fruits, abundant in some regions, commonly serve for the preparation of preserves of pleasing flavour, in which the vitamin C content can easily be maintained.

When these fruits are picked at the desired stage of ripeness and rich in vitamin C, a daily dose of 50 gm. of preserves is sufficient to assure amply the requirements of the human organism in antiscorbutic vitamin. Such preparations, therefore, may be most useful in regions where vegetables and fruits are scarce in winter.

Citrus fruits (tangerines, oranges, lemons, etc.) represent a very important source of ascorbic acid, a litre of juice containing from 0.6 to 0.8 gm.; this stable product, of agreable and varied taste, sometimes, unfortunately, is very dear.

A fruit very rich in vitamin C is that of *Actinidia chinensis*, 1 gm. of which contains about 2.94 mg. of vitamin C, or, in round figures, 300 mg. per 100 gm. of fresh fruit. With equal weight, this berry is 6 times as rich in vitamin C as the lemon or the orange. One fruit may furnish the total quantity of vitamin C necessary for the adult man (60-75 mg.), and even a little over, on an average, as it may contain from 65 to 110 mg. of ascorbic acid, according to size.

This fruit keeps for 3 months after picking without any reduction in its ascorbic acid content. Fresh, it is excellent, moreover, it lends itself to all sorts of culinary preparations and may easily be preserved by means of the classic methods of sterilization. It appears that cultivation would be profitable in many countries, experiments would be useful.

What, in other times, would have passed as a scientific curiosity, today may become an important element in the health of the people.

Among the vegetables, cabbages are unquestionably an important source of ascorbic acid (from 1 to 2 gm. per kg. of the fresh product, on harvesting). In reality, it is not so important as it seems, for the following reasons:

(1) The ascorbic acid content of the cabbage diminishes rapidly after harvesting and often falls to half or a quarter of its value at the time of consumption, when it is a case of utilizing cabbages which have passed through the hands of several middle-men and which have remained for several days in the warehouse.

(2) When cabbages are consumed cooked, there is a further very high loss of ascorbic acid at the time of cooking, the longer the vegetable has been kept, the greater the loss (in absolute value).

(3) Cabbages or their different preparations, if employed too unvaryingly in the diet, fatigue the stomach.

GALLOF has carried out numerous determinations of the vitamin C in different organs and tissues of fresh plants, employing the MARTINI and BONSIGNORE

method. The following are the quantities, in mg. per 100 gm. of fresh matter, he found in the red beet and kohl-rabi:

Beta vulgaris var. *rapacea* (red beet):

Root (cross section)	traces
Leaf petioles (rather wilted)	1.9 mg.
Entire leaves (small)	5.3 »

Brassica oleracea var. *caulo-rapa* (kohlrabi)

Primary formation (cross section)	34.2 mg.
Secondary formation (» »)	48.8 »
Tertiary formation (» »)	65.8 »

On the other hand, LUNDE obtained the following results:

Cichorium intybus (large-rooted chicory)

Root (cross section)	3.3 mg.
Leaves (» »)	16.3 »

Brassica oleracea var. *acephala* (borecole)

Stems, internal part. white, pulpous	35.4 mg.
Stems, external part, green	40.0 »
Entire leaves	120.0 »

According to the investigations of SOSA-BORDOUIL on vitamin C in the tomato (*Solanum lycopersicum*) and chillies (*Capsicum annuum*), the fruits of the tomato variety 'Italian Large Yellow ' contain less of this vitamin (12-17 mg. per 100 gm.) than the small fruits of the ' Cherry ' tomato variety (44 mg.). In general, this vitamin is more abundant in ripe tomatoes and in small-sized varieties than in others. In the chilli, 300 mg. of vitamin C per 100 gm. were found.

In the large-roted chicory, the borecole and the red beet the leaves are much richer in vitamin C than the other parts of the plant.

As a rule, the vitamin content of the parts manifesting an active cellular life is always much higher than that of the corresponding reserve organs.

IV. Factors which influence the vitamin content of agricultural products

Relatively little study has been given to the question of ascertaining to what extent the vitamin content of different varieties of the one and same plant varies. According to the results obtained to date, these differences are appreciable. Thus, for example, the vitamin C content of different potato varieties markedly distinguish them from each other.

A practical question, very important from the standpoint of alimentation therefore, is that of determining to what extent the vitamin content of plants varies in correlation with the different factors which influence their growth, such as manuring (manure, chemical fertilizers), soil reaction, ultra-violet rays, selection, etc.

Vitamins are necessary for the special metabolism of plants. It has been proved that the addition of vitamin C accelerates the growth of plants at an early stage. The plant is capable of synthesizing this vitamin, but the synthesis, is, under certain conditions, insufficient for optimum growth.

The results obtained by several experimenters with pot cultures on quartzose sand prove that the quality of the plants, considered from the physiological viewpoint, was improved by manuring. Contrary to the experiments mentioned, SCHEUNERT, who undertook important studies on the vitamin content of foods essential for the people, came to the conclusion that the vitamin content of foods could not be definitely determined by laboratory experiments alone.

The vitamin content of plants grown in the field naturally varies less than in laboratory experiments, owing to the difference of the factors in play.

In determining the vitamin C content of plants by laboratory experiments, HANN and GÖRBIG found that nitrogenous, phosphatic and potassic fertilizers increased appreciably the vitamin C content of spinach, however, too strong a dose of these fertilizers may cause the proportion to diminish.

According to WILSON, DRUMMOND, HEILBRON and MORTER, given grass manured with nitrogenous fertilizers and dried artificially, the cow produces a butter decidedly more yellow in colour, therefore richer in carotene, than with grass having had no nitrogenous fertilizer.

The results of the investigations of VIRTANEN indicate that nitrogenous, phosphatic and potassic fertilizers increase appreciably both the carotene and vitamin C content of plants. An excessive dose of potash and phosphorus, however, causes reduction in content, this is not the case with high doses of nitrogenous fertilizer.

Leguminous plants inoculated with more active bacteria contain more vitamin C than those inoculated with less active bacteria.

Investigators have all, without exception, found that fertilizers influence not only the vitamin C but also the carotene content of plants.

According to IJDO, nitrogenous fertilizer increases appreciably the vitamin C and carotene content of spinach, on the other hand, potassic fertilizer increases the vitamin C content but reduces the carotene content.

OTT considers that nitrogen and potash, especially if combined in the fertilizer, increase the vitamin C content of potatoes and that in yellow turnips potash increases the carotene content.

According to SCHUPHAN, the carotene content is higher in carrots and tomatoes which have been given manure together with nitrogenous, phosphatic and potassic fertilizers than those given manure only.

In their experiments on fields planted to green cabbage, carrots, beets and spinach, PFUTZER and PFAFF proved that nitrogenous fertilizers as well as nitrogenous, phosphatic and potassic fertilizers combined, increase the carotene content; their influence on the vitamin C content is less.

The pH of the soil exercizes an action identical to that of fertilizers on the carotene and vitamin C content of plants, thus with a optimum reaction of the soil, the vitamin content is more marked than with an unfavourable acidity.

Besides plant substances, animal products have, from the vitamin standpoint, a considerable importance varying according to the factors which influence

their content. It may be said in general that the vitamin content of animal products can be definitely influenced by the forage régime.

As regards vitamins, meat is a defective food, on the other hand, the viscera for example, the liver, are rich in vitamins. Eggs are also valuable from the vitamin standpoint. It is milk, however, which constitutes the principal animal food product for food: it may contain all the vitamins and in a very easily assimilable form.

In many countries, especially those of the North, a complete diet cannot be obtained without milk.

The adequate feeding of dairy animals is of decisive important for the vitamin content of milk.

As sources of vitamins, vegetables and fruit correspond best to milk.

According to SHARP and JENSEN, the vitamin A content of milk varies, to a certain extent, on feeding, the vitamin C content of milk is independent of type of feed, however, an abundant quantity of vitamin C prevents the rapid oxidation of this vitamin in the milk, and at the same time, tallowy odour. A diet deficient in vitamin C causes the appearance of an abundant quantity of oxidase of ascorbic acid in the milk and, consequently, a rapid oxidation of vitamin C.

The young shoots of grasses and alfalfa leaves are rich in carotene and furnish the grazing animals with a good source of provitamin A, fodder dried in the shade maintains its provitamin capacity if kept in compact masses at a low temperature.

Badly cured and stored fodders rapidly lose their value, at the end of winter, therefore, there is a risk of dairy cows having feed deficient in vitamin A, consequently, the milk and butter will not have a high provitamin value.

In dry summers, animals deprived of growing herbage may suffer from avitaminosis A, the consequences are especially serious for cows in calf, mares in foal, etc.

Even in the human species, diverse anomalies found in new born infants, as for example, defects of the visual organ, appear imputable to a deficiency of vitamin A in the maternal diet, before and after conception. Part of the carotene ingested by cows is accumulated in the body and part is excreted with the milk. The proportion of each depends on the amount of carotene in the daily ration. Thus, for example, cows receiving daily 300 to 500 mg. of carotene (corresponding to 300,000-500,000 I. U. of vitamin A) excrete 1 to 2 per cent. in the butterfat.

Cows deprived of carotene continue to excrete vitamin A at the expense of their own body reserves. The proportion, in the butterfat, of carotene excreted as such, or else after transformation into vitamin A, also depends on the breed of dairy cow, some breeds, like the Guernsey for example, furnish a milk with a relatively higher carotene content than that of Jersey cows.

The vitamin value of butter to a large extent depends on: the quantity of vitamin A stored up by the milch cow, the quantity supplied in the daily ration and, when this ration is deficient, the time during which the cow is deprived of sources of vitamin A.

The weak action of vitamin A in milk produced with an ordinary winter ration is due to the following reasons: the herbage is generally dried and transformed into hay at the beginning of the flowering period or even at a still later stage, at this moment, the carotene content has already decreased appreciably, during desiccation and subsequently during storage in the barn, the carotene content continues to diminish.

The progress attained in forage conservation, however, has made it possible to have a forage in winter as rich in vitamin A as in summer. If herbage is kept when cut at an early stage of growth or any forage still green treated according to the A. I. V. process (in which the pH is rapidly brought to 3-4 with the addition of acid), the respiration of the plant cells is checked as also the harmful processes of fermentation and other forms of decomposition. In this way the vitamins can also be conserved. The increase in carotene content found in A. I. V. fodders depends on the formation of certain carotenoids from xanthophyll.

With forage treated in this way, it is possible to have milk rich in vitamins in the winter.

By feeding A. I. V. treated forage, the vitamin A content of milk in winter can be maintained at the same level as in winter. VIRTANEN found, on an average, in the milk of an estate where A. I. V. fodder was fed, approximately 60 per cent. of the total quantity of vitamin contained in the fodder.

The A. I. V. process also conserves vitamin C better than any other method. The feeding of A. I. V. fodder prevents entirely tallowy odour and taste in milk and, at the same time, stabilizes the vitamin C. With this method, the other vitamins are equally well preserved.

In some northern countries, the use of the A. I. V. process is becoming ever more extensive and thus the vitamin content of milk and butter is increased. The application of this method is, from every point of view, a natural and extremely advantageous measure.

The mode of feeding animals affects the vitamin content not only of milk, but also of the internal organs, especially the liver, as well as eggs.

Plant carotene may, to a large extent, through the intermediary of domestic animals, be converted into vitamin A which, like the carotene from animal products, is reabsorbed in the digestive canal of man. Thus, the necessary quantity of vitamins in a diet can be supplied without modifying the alimentation of a people, only by changing the type of stockfeed. In this way, vitamin shortage would be largely compensated. In this instance, science may thus exercize a decisive action on vitamin production and, consequently, on the diet of the people.

V. Artificial enrichment in vitamin content of food products

(*a*) Direct vitaminization

Efforts aiming at preparing food products of high vitamin activity (fish liver oil and its derivatives, yeast extracts, valuable source of the vitamin B complex, synthetic ascorbic acid) and vitaminizing foods, may to a large extent safeguard the health of the individual and preserve the mass of the people from the dangers which menace it.

In order to increase the vitamin A content of foodstuffs, carotene or provitamin A has been added to fats (different butters, margarine, oil, etc.), producing an abnormal colour.

In regard to vitamins B, experiments have been made adding to flours brewer's yeast, malt extract, bran or cereal germs (rich in vitamins B), with a view to obtaining vitaminized bread, pastes and cakes.

The expreme instability of the antiscorbutic vitamin has to date frequently prevented good results on an industrial scale. It has been found, however, that concentrated extracts of vitamin C, added to different foods, maintain their activity if the temperature remains low.

(*b*) Irradiation of foodstuffs

The enrichment of foodstuffs in the antirachitic vitamin (vitamin D) involves the greatest number of problems, the most serious and the most complicated. Generally, it is a question of the artificial transformation, by irradiation, of the sterols contained in the foodstuff, which is exposed to ultraviolet rays, in thin solid or liquid layers, under well determined conditions.

It is known that non-antirachitic substances, containing fats, become antirachitic when subjected, under specially determined conditions, to the action of ultra-violet rays. These are the sterols in the unsaponifiable part of the fats which alone acquire antirachitic properties under the influence of these irradiations.

In consequence of numerous studies and experiments (Hess, Steenbock, Haman, Fleisch), industry, especially the condensed milk industry, now places on the market foodstuffs which by means of irradiation, contain an appreciable quantity of the antirachitic vitamin.

The early opinion, according to which it was the ergosterol of the milk which was transformed, by irradiation, into the antirachitic vitamin, has to be modified in consequence of the finding of Haman, Steenbock and Fleisch that the provitamin of milk is 7-dehydrocholesterol, so that irradiated milk does not contain the substance D_2, but the natural antirachitic vitamin D_3.

Although irradiated milk has marked an undoubted progress in regard to the prevention of rickets, nevertheless it could be queried as to whether this richness in antirachitic factors is not obtained to the detriment of other vitamins contained in the milk.

In fact, a partial destruction of vitamins A and C might be supposed, as they are known to be susceptible to the action of ultra-violet rays. As regards vitamin A, the destructive action of ultra-violet rays on this substance has been demonstrated on many occasions by several investigators (Chevalier, etc.)

This possible destruction of vitamins by irradiation has led Fleisch to ascertain the vitamin A content of various irradiated milks found on the market, in the form of condensed milk or powdered milk. This milk being intended chiefly for use as an infant food, it would be worth while knowing the vitamin A content in order to judge if it can supply, alone, all the vitamin A the infant requires.

According to Fleisch, the irradiation of milk, effected to give it an antirachitic property, does not modify in any way the vitamin A content. Condensed milks, sweetened or otherwise, and powdered milks are richer in vitamin A than

sterilized condensed milks. The sterilization of milk in the presence of a small residue of air or nitrogen which usually remains in the tins does not affect the vitamin A content and that of vitamin C hardly at all.

Among the products irradiated are: liquid milk – desiccated milks — lipo-proteinic mixtures obtained from milk — butter — bacon — vegetable oils — chocolate — flours — bread — alimentary pastes — vegetables — orange juice — brewer's yeast — dried cerebral matter — etc. — briefly, all the foods which are supposed to contain the activable sterols.

In various countries, important charity institutions practise the systematic irradiation of milk or brewer's yeast on a large scale.

Milk, butter, egg yolk, yeast, properly irradiated, contain 10 to 100 times more vitamin D than cod liver oil, which, however, has a high content.

Irradiated wheat flour contains 0.1 mg. calciferol per kilogram.

(*c*) Indirect vitaminization

Attention should also be given to the indirect vitaminization of certain foods such as milk or eggs, that is, the enrichment in vitamins through the intermediary of the cow or hen which supplies the product.

By vitaminizing artificially the feed of the cow, the milk can be enriched in vitamins A and D, this operation, however, is less effectual in the case of vitamins C and B.

With eggs, only the vitamin D content can be increased by the artificial vitaminization of the poultry feed.

On the other hand, the milk or eggs can be enriched in vitamin D by irradiating, under certain conditions, the cows or hens themselves.

There is one point of importance however: the aptitude of the organisms to store the vitamins in the tissues (with the exception of the liver) is not very great and all surplus is rapidly eliminated.

In food artificially enriched in vitamins, the nutritive value does not appear to diminish following an enrichment in vitamins C, B or A and also D when these vitamins are simply added without excess.

Perhaps this not the case however for vitamin D when produced in the food through irradiation. Irradiation affects not only the sterols, but, evidently, each chemical principle present in the foodstuff thus treated.

It is possible that certain of these modifications constitute a sort of predigestion which may be useful, but caution should be observed as irradiation produces, in the foodstuff, physico-chemical and biological changes, the importance and remote consequences of which have not yet been specified.

The continual and excessive ingestion of artificially vitaminized foods necessarily presents, after a certain time, disadvantages which are particularly serious in the case of the antirachitic vitamin or vitamin D. Cases of hypervitaminosis D due to technical defects in preparation and to excessively high doses were reported some years ago.

It should be asserted today that the increasing and uncontrolled use of foodstuffs artificially enriched in vitamin D irradiation (flours, biscuits, butter, chocolate, milk, etc.) are not to be recommended.

VI. Transformation of food products and conservation of vitamins

The development of the processes of conserving foodstuffs constitutes one of the principal tasks of the practical study of vitamins. Taking as raw material natural food products, the following industrial operations are practised: intense production of foodstuffs of high nutritive value in a small volume, conservation of these foodstuffs by desiccation, concentration, cooking, sterilization, ensilage salting, etc. Whatever seems to have an adverse effect on preservation, what appears useless or impure is eliminated, destroyed, the aim is to put up products pleasing to the eye and of agreable smell, in a small volume.

It is indispensable that all food manufacturers should place themselves on physiological ground, always keep in mind the question of public health and not merely consider it from the economic standpoint.

With properly preserved products, a good source of vitamins should be possible throughout the year.

Vitamin D is more resistant to oxidizing agents than vitamin A and remains stable in the presence of alkalis.

The vitamin A in cod liver oil or in commercial preparations is rapidly destroyed by oxidation in opened bottles, unless kept in cold storage.

Vitamin B is easily destroyed by oxidation and at a temperature over 100° C. The other vitamins of the B complex are more or less resistant to the action of heat.

The antiscorbutic vitamin C is extremely susceptible to the action of oxidizing agents and to that of heat especially in an alkaline medium. The use of bicarbonate of soda to maintain the natural colour of vegetables facilitates the destruction of this vitamin and therefore should be avoided.

The conservation of the antiscorbutic vitamin in natural products constitutes a very complicated problem. The most serious danger to which vitamin C is exposed is oxidation by atmospheric air which is irreversible and produces a total loss in antiscorbutic activity. The rate of this oxidation process depends on the following factors: oxygen content—temperature—presence of protective substances in the food—acid or basic reaction—presence of heavy metals (as for example, traces of copper, which exercize a very marked destructive effect). Consequently, the treatment to be applied in the conservation of vitamin C in natural products must vary according to each particular case.

A more active influence on the vitamin content of food products may be effected through the development of more rational processes of conservation.

The potato, the vitamin content of which diminishes, from autumn to spring, to about a third of its value, is a good example. Potatoes being, in many countries, the principal source of vitamin C, this very considerable decrease in vitamin content is of great importance in the nutrition of the people.

It is expedient to examine the influence of chemical preserving substances, such as boric acid, salicylic acid, benzoic acid, etc., on the vitamins contained in preserved foods. Numerous analyses effected by PERAGALLO show that these substances do not appreciably reduce the vitamin content of preserved foods.

According to JACOBSEN and FAULENBORG, sterilized fruits lose less vitamins then fruit preserved by means of benzoic acid.

Attention should also be given to the loss in vitamins in milk, vegetables, etc. through cooking in certain receptacles. The experiments of FLEISCH indicated that the duration of heating up to boiling point in itself exercizes an appreciable effect, the longer the period, the greater the loss in vitamin C. With an equal period of heating, the destruction of vitamin C in milk is minimum when Pyrex glass receptacles are used, followed by those, in increasing order, of plain aluminium, enamelled aluminium, newly plated copper, enamelled cast-iron and finally poorly enamelled copper, with which loss is highest.

Food manufacturers should choose the foods particularly rich in one or more vitamins and should endeavour to preserve these intact, taking into consideration the numerous data acquired regarding their conservation and possible destruction.

Another case may arise: this is the application of old methods of preservation or preparation of food, followed by a 'revitaminization' of food products which have been 'devitaminized' by industrial processes. The artificial vitiminization of foodstuffs, however, necessitates, for its judicious application, more knowledge than natural vitaminization and may, in certain cases, present real danger: hypervitaminosis, organic disequilibrium, toxicity.

It is well proved that the total or partial deficiency of a vitamin produces acute or chronic diseases, but it is not sufficiently known that excessive doses of certain artificially vitaminized products brings about a disequilibrium in the organism. For the different vitamins, therefore, it is necessary to consider not only insufficient and optimum doses but also harmful doses.

On the whole, the people of today undoubtedly suffer from vitamin deficiency.

The endeavour aiming at improving the quality of food products, at enriching them in vitamins and preserving them, should be understood by all who will benefit therefrom.

The public should be educated more thoroughly in regard to the utilization of food products, the use of different methods for improving and transforming them, as well as the various ways of consuming them.

VII. Control of foodstuffs and international conventions

The first International Food Conservation Congress, held at Paris, October 14-16, 1937, was the occasion, not only for important scientific information, but also for numerous reports on the legislation and organization relative to the industry of and trade in preserved foods.

The application of legislative principles gave rise to a certain number of regulations regarding: factory organization, the composition and eventually the standardization of the products, the cleaning and disinfection of the factory premises and the machinery coming into contact with the food products, cleanliness and health of the personnel, etc.

In many countries, the general laws, in several special cases, are also applied to vitamins, but they do not suffice to establish a specific and complete system of regulation.

This hiatus regarding vitamins in general will necessarily have to be filled in the future.

In the interest of public health the following measures are required:

(1) The explicit indication of the vitamin content of foods, expressed in international units;

(2) the rigorous suppression of any advertisement exaggerating to an absurd degree the good effects of vitamins,

(3) an effectual control of artificial vitaminized products, in general, a true control of all foods presented as being exceptionally rich in this or the other vitamin,

(4) the knowledge of methods of preparing vitamin extracts in the pure state, and of the processes of 'revitaminization' or artificial vitaminization of foodstuffs.

The control of foodstuffs as well as the repression of fraud as regards vitamin content, should be effected according to methods authorized on the basis of a study undertaken by international technical organizations, and be made the object of international conventions.

The precise knowledge of loss in vitamins, the thorough study of practical methods for enriching food products in vitamins and maintaining their vitamin activity, are no less indispensable than the encouragement of scientific research and technical inventions made with a view to improving the diet of the people.

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THE CONSERVATION OF FOOD PRODUCTS AND ITS DIFFERENT ASPECTS

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The more the available nourishment diminishes, the more difficult and costly it is to procure the necessary foods and forages, the more evident is the need for protecting the products obtained from all loss and damage. At a time when many countries are experiencing great difficulty in feeding themselves, taking care of food stocks is a necessity of the moment. In view of this state of affairs, the International Institute of Agriculture has set itself the task of assembling, in reference to the conservation of food products, the data and material obtained in the different countries as a result of scientific research and practical experiments, in order to place them at the disposal of all those whom its voice may reach and thus come to the aid of suffering humanity, as well as sustaining agriculture and industry in their task heavier today than ever.

The information which follows serves as an introduction to a series of articles in which the questions concerning food conservation are to be studied. In this article the subsequent points are treated:

(1) *Problems and evolution of the conservation of food products* — (2) *Causes of their deterioration and its prevention* — (3) *Influence of preserving technique on agricultural production* — (4) *Present problems in food preservation.*

I. Problems and evolution of the conservation of food products

1. Definition and importance

The conservation of food products constitutes part of the question of up-keep of stocks. As such, it should protect the raw and finished agricultural products against losses and, moreover, convert the produce into a condition facilitating its rational distribution, and also rendering it as independent as possible of time and space. Through the possibility preserving procures of restricting losses and adapting itself to a demand for foods which varies according to time and space, the preservation of these foods is of the highest importance today. The maintaining of stocks signifies, in a general way, preventing their quantitative or qualitative diminution. The protection of stocks consists, in particular, in protection against damage caused by diseases and pests. As regards stocks of a vegetal nature, this is a matter for the Plant Protection Service.

There are no positive data available on the subject of total damage produced through various causes, but partial estimations indicate the enormous value of the losses sustained.

Thus, for example, the loss in public property, in Germany, alone, caused through the deterioration of food products is estimated at 1 mil-

liard RM (DIEMAIR). According to ZIEGELMAYER, in this country approximately 10 per cent. perishable foodstuffs spoil every year, and this loss is as much as 25 per cent. for fruits and vegetables, certainly representing several hundred millions of the total loss indicated.

The loss in weight which takes place during the normal duration of storage is estimated for various products as follows: cereals, 1-3 per cent.—oleaginous seeds, 5-12 per cent.—potatoes, 4-30 per cent.—mangolds, 10 per cent.—7-20 per cent.—ensiled forage, 5-35 per cent. As long as this waste is merely a loss in moisture, it can be disregarded, but when it has to be ascribed to respiration and fermentation, it represents a corresponding loss of food substance.

More detailed data are available on the protection of stocks. For instance, ZACHER estimates the damage caused in Germany to grain stocks by the corn weevil (*Calandra granaria*) at 100 million RM per year (1933). While as regards the rice weevil (*Calandra oryzae*), the damage it causes annually to maize stocks in 8 southern States in the United States is calculated at 28 million dollars. In Japan, the Angoumois grain moth (*Sitotroga cerealella*) makes the storage of wheat and barley difficult. In the United States, this noxious insect has caused losses in grain (quantity) estimated at 56.2 per cent. for wheat and 13-24 per cent. for maize, and the total damage it causes to stored grain was valued by COTTON and GOOD (in 1937) at 30 million dollars. In Egypt, the annual damage through this insect is recognized as amounting to 2 million Egyptian pounds sterling. Among stimulant products, stored tobacco is attacked chiefly by *Ephestia elutella*, particularly in Bulgaria, Greece, Yugoslavia, England, Rhodesia and the United States. BOVINGDON (1933) estimates at 100,000 pounds sterling the annual loss sustained by the English tobacco trade through this insect. In the United States, REED and LIVINGSTON report a similar loss amounting to 2,124,000 dollars per annum.

Pathogenic fungi attack the tissues of stored vegetables and give them an unwholesome and spotted appearance. Phytophthora cause very severe damage to potatoes in storage.

Animal products are also attacked by noxious insects. HOWARD states that in the United States, *Necrobia rufipes* and the cheese fly (*Piophila casei*) damage meat to an extent of about 1.2 million dollars a year.

A large part of these losses could be avoided through suitable conservation methods and thus an enormous national saving effected.

It is not in this protection against losses, however, that the primordial sense of the conservation of food products lies. The basic idea of conservation arises rather from the desire to possess provisions, to constitute stocks at the time of superabundance and to keep them for periods of scarcity and want which, on the one hand, are naturally the outcome of the regular or irregular succession of 'fat' years and 'lean' years, of rich and poor seasons, and, on the other hand, depend on the destiny of man which impels him to destroy his work in fighting, beginning from the primitive quarrels between families up to the present conflicts between peoples. In other words, the conservation of food products is a means of compensating the fluctuations in food supply dependent on the season and on other causes, operation all the more important the greater these

fluctuations. Conservation relieves producers and distributors of the necessity for immediate consumption; it makes man independent up to a certain point of the factor time.

Products made conservable and generally reduced to a volume smaller than that of the raw products can also be transported more easily and over a longer period. In this way, conservation facilitates regional compensation; it aids in overcoming the factor space.

Moreover, conservation enables a more simple distribution and a more economic consumption of the foodstuffs available, as well as more rational and more varied diet depending less on season.

In agriculture, particularly in the cultivation of plants, it is not easy to determine the quantity to be produced to meet a fixed demand and to calculate beforehand the harvest which will be reaped, as yields are subject to unforeseen fluctuations. On the other hand, exceptionally high yields lead to waste, to irrational use or even to the destruction of the products.

Fluctuations in harvests are very considerable in fruit cultivation and, in particular, in wine-growing. In Hungary, for example, over a period of twelve years, between the minimum and maximum differences of the whole country, differences of 68 per cent. in vegetables and even 228 per cent. in fruit were found. These fluctuations are still higher in different parts of the country. Naturally the variations in consumption and price correspond to the local, seasonal and annual fluctuations in the harvest and, the purpose of conservation technique is to establish a balance in the common interest of both producer and consumer. It is in international trade, however, that food conservation acquires the greatest economic importance, when it is a question of supplying, with the least possible loss, regions with the exotic products they require from distant zones. In this respect, it suffices to recall the enormous importance of banana production and the banana transport ships. In this way, mass production foodstuffs from overseas have lost in a short time, on the European market, their character of luxuries to become popular articles of food. On the other hand, it was to the interest of the overseas producer to learn the requirements and demands of distant markets.

The possibilities supplied by canning or otherwise preserving foodstuffs opened up a previously unsuspected extension of the influence of market practices and popular tastes. The effects extend much further than the limited territory of fresh merchandise to the distant countries which supply the market with foodstuffs made conservable. In this way, a fruitful combination between reciprocal interests at great distances is established. The influence of the English bacon market on the different producing countries is a particularly significant example.

The post-war agricultural depression (after 1918) gave a strong impetus to the preserving of foodstuffs. The search for new possibilities for the disposal of surplus products, the competition at the home and foreign markets, stimulated the spirit of invention and enterprise to a remarkable degree. Science then supplied, with untiring fervour, the necessary bases for the results which are seen today.

TABLE I. — *Total exports of canned foods from the principal exporting countries in 1937.*

(According to the 32nd Report of the Imperial Economic Committee, London, 1939).

Fruit		Vegetables		Fish		Milk and its derivatives		Meat	
5,032 cwt. (000)		3,438 cwt. (000)		6,288 cwt. (000)		6,108 cwt. (000)		3,619 cwt. (000)	
Share per cent. of the different exporting countries.									
U. S. A.	48	Italy	42	Japan	35	Netherlands	70	Argentina	42
Malaya	25	Canada	18	U. S. A.	14	Denmark	5	Uruguay	19
Australia	11	Spain	13	Portugal	14	United Kingdom	5	Brazil	13
Japan	10	U. S. A.	10	Canada	11	U. S. A.	5	Pologne	13
Canada	5	Belgium	5	Norway	11	Canada	4	Denmark	5
		France	4			Australia	3	U. S. A.	3
						Eire	2	Australia	2
						New Zealand	1	New Zealand	2

It is difficult to establish statistics covering the ensemble of food conservation and the trade in preserved foods *. The figures given by the canning industries, however, indicate the importance of this branch of food production. In 1937, for the five chief products (fruits, vegetables, fish, meat, milk and its derivatives), the exports of the principal producing countries amounted in round figures to 24.5 million cwt. A relatively small number of countries furnished practically all the canned goods for the world market. Some countries specialize in certain products and thus dominate the market, like Italy for canned tomatoes, Japan for fish and Hawaii for pineapples.

Table I gives a fairly exact conception of the world trade in canned foods in 1937 and of the distribution of the different products to the different countries.

Despite the importance, in absolute values, of the quantities of preserved foods, their percentage of the total crop of raw products is, in general, small. This may be seen from Table II in which are given the figures, according to B. KARDOS, for Hungary.

TABLE II. — *Fruit and vegetable production and their industrial utilization in 1936.*

Foodstuff	Quantity harvested	Industrial utilization	Percentage
Fruit	3,900,000 qls	46,063 qls	1.2
Cucumbers	206,355	3,564	1.7
French beans	38,946	3,042	0.7
Green peas	145,956	9,777	6.7
Tomatoes	818,012	380,404	46.0
Paprika	90,897	2,524	2.5
White cabbage	411,289	30,843	7.5
Other vegetables	954,134	32,804	3.4

Only tomatoes show a high percentage. For all the other products the percentage could still be increased appreciably.

In estimating the economic importance of the conservation of foodstuffs, it should not be forgotten that, while canning makes it possible to keep them saleable over a longer period, it does not, however, save them from the general rule of supply and demand, which governs them in the same way as other inalterable merchandise. The carrying over of canned or preserved products from one season to the next leads to flooding of the market with the subsequent consequences, as was shown on a large scale in the case of the American wheat pool and the surplus stocks of Brazilian coffee. It should also be noted that, in general, it is not easy for the canning industry to absorb, at a reasonable price, an inci-

* In regard to the economic importance of food conservation, we will limit ourselves to the following brief remarks. For further information, the reader is referred to the excellent Report, arranged according to country, that the Delegate of the Netherlands to the International Institute of Agriculture, HEER H. VAN HAASTERT, presented in 1934 at the International Congress of Agriculture held at Budapest (see *Actes du XVIème Congrès International d'Agriculture*, Budapest, 1934, Vol. III, pp. 565-584).

dental and irregular crop surplus, on the contrary, it requires a well regulated supply as regards both quantity and quality. The utilization of temporary over-production concerns chiefly the farms conserving their own products and the local industries employing adequate conservation methods.

2. History of food conservation

History * shows that the human tendency to conserve food, namely to practice a far-seeing economy by collecting stocks is as old as the preparation of food by man. The conservation of foodstuffs has developed, from simple forms, in a direction determined on the one hand by nature itself (climatic conditions), on the other, by the mode of living, the requirements and habits of man.

The drying of meat and fish in the sun is one of the oldest means of conservation. Pemmican, the dried buffalo meat of the North American Indians was well known. Drying in the open of fruit, vegetables and mushrooms was carried out in every country, and even today, continues to be a household practice.

The salting of meat and fish is a traditional process. The salted fish called 'moluha', still esteemed today in Egypt, must have been well known 2000-3000 years ago. The ancient Romans used to make a fish conserve known as 'garum'.

It is proved that at about 1300 the Hanseatic League possessed in Sweden, along the Schonen coast, special curing houses where fish was cured.

The brining of vegetables is a Tartar practice which was introduced into Europe by the Slavs.

Pickling seems to have been originated by the Hollander Pökel or Pökling who, about the middle of the 13th century, was the first to preserve meat with salt, saltpetre and spices; the meat was left in the solution which formed for a fairly long period and then smoked.

Fermentation which renders saccharated liquids conservables owing to the formation of alcohol, is one of the oldest methods of conservation known in history. As is known from the Old Testament, wine has been made since the most remote times of the history of man.

Conservation by means of heat and the elimination of air was already practised by Papin (1647-1712), the well known inventor of Papin's Digester. The real founder of the modern technique of conservation, however, was the French cook F. Appert (1750-1841), who, in 1810, in a treatise entitled 'L'art de conserver pendant plusieurs années toutes les substances animales ou végétales' made known the process which he had already invented in 1804 and with which he won the prize of 12,000 francs set by Napoleon I. The Appert method was greatly in advance of the knowledge of its scientific bases, only revealed much later through the investigations of L. Pasteur and of R. Koch.

* The data given here have been taken from the work of W. Diemair entitled 'Die Haltbarmachung von Lebensitteln', Stuttgart, 1941.

Refrigeration has long been employed by the most primitive peoples for the conservation of foodstuffs. In Eastern Asia, frequent use is made of ice-houses for the preservation of fish, fruit, etc. The development of the modern technique of refrigeration, however, only received its first impetus with the invention and evolution of ice-making machinery in the second half of the 19th century.

II. Causes of the deterioration of foodstuffs and its prevention

1. Causes of loss

The conservation of foodstuffs consists in preventing as far as possible qualitative and quantitative losses caused by physico-chemical and physiological processes and by the development of noxious plant and animal organisms. Any change in form, quality, odour or taste indicates the onset of deterioration.

The changes of a physico-chemical nature * are due chiefly to the normal constituents of the air (oxygen, carbon dioxide) and to that of moisture, light, cold and heat. The last mentioned in particular produces internal chemical modifications at a rate proportional to the rise in temperature.

Many natural or artificial pigments are susceptible to the action of light, air or heat. A more or less prolonged action of these factors, therefore, produces in the preserved foodstuff a discoloration which is not always necessarily detrimental.

In preserved products, under the influence of air and heat and even without the presence of micro-organisms, acid, acrid or bitter substances may form with deterioration in odour and taste. During storage (in the case of wine, for example), the aroma at first develops and subsequently diminishes or else alters in an undesirable manner.

As regards loss through physiological causes, mention should be made in the first place of respiration or the transformation of the organic matter into carbon dioxide and water produced through oxidation. The losses caused through respiration may be very high. All conservation methods, therefore, aim at checking or at least reducing the eventual respiration of the substance stored.

When the plants are deprived of oxygen, however, intramolecular respiration may take place as the oxygen necessary for respiration (formation of CO_2) is supplied by a transposition of atomic groups. In this way, the carbohydrates, proteins and fats may be diminished through respiration.

In principle, the fermentation provoked by anaerobic bacteria (to which we will return later) is identical with the process of intramolecular respiration.

Further mention may be made of the enzymes, complicated not very stable compounds which are secreted in plant and animal organs. Even in very small amounts they can modify large quantities of certain substances.

* The details which follow have been taken chiefly from the work of H. Serger entitled 'Konserventechnisches Taschenbuch', Braunschweig, 1942.

Besides the damage caused to plants by diseases and pests, already mentioned, the losses due to the influence of living organisms should be ascribed mainly to the activity of saprophytic micro-organisms (bacteria, hyphomycetes), which develop on dead organic matter and give rise to decomposition phenomena.

Mould is the name given to the modification produced by lower fungi, the most common being *Mucor mucedo* (common white mould), which develops its white mycelia on fruit preserves, vegetables, etc., and *Rhizopus niger*, ramified fungus with brownish mycelia; both belong to the Phycomycetes. Among the Ascomycetes, the best known are those of the *Aspergillus* and *Penicillium* genera. Mould chiefly attacks foodstuffs with a high water and sugar content; it produces the decomposition of the protein and a loss in carbohydrates, with formation of carbon dioxide.

Fermentation properly so called is a process of decomposition produced through the activity of Saccharomycetes; in alcoholic fermentation, the sugar splits into alcohol and carbon dioxide. There are also fermentations caused by bacteria, in particular, lactic, butyric, acetic fermentation, etc. As is known a well conducted fermentation can be very useful; on the other hand, undesirable fermentations are among the chief causes of the deterioration of stocks (preserves, silage). Mention may also be made of the bacteria which ferment cellulose (OMELIANSKI).

The most serious form of decomposition for the maintenance of stocks, however, is putrefaction which is produced by saprogenic bacteria. Under the influence of these bacteria, foodstuffs rich in protein acquire an unpleasant odour and taste, become glutinous on the surface and loss their solid consistency; decomposition of the albuminoids occurs, manifested by the formation of ammonia and hydrogen sulphide and by that of toxic substances (alkaloids of putrefaction, toxalbumins).

When putrefaction takes place in the presence of oxygen, oxidation phenomena may occur. A sharp boundary between putrefaction and decomposition does not exist. Putrefaction constitutes the final phase in the process of decomposition.

2. TECHNIQUE OF FOODSTUFF CONSERVATION

When the causes of the losses in stored foodstuffs are known, then the measures best suited for their conservation can be found.

Since conservation methods will form the subject of a series of special articles, mention will only be made of the most important, according to DIEMAIR.

Among them are distinguished: physical processes—chemical methods—irradiation—use of special packing and wrapping materials.

(a) *Physical processes*

Among these processes, mention should first be made of cold storage practised in its most simple form in ice cellars, ice-boxes and refrigerators. The necessary coldness is furnished not only by natural ice but also by refrigerator machines em-

ploying the cooling action of ammonia, carbon dioxide, sulphur dioxide or methylene chloride, and suitable for both small installations and large industrial establishments.

In cold storage, frequently a supplementary protective gas such as ozone, carbon dioxide or nitrogen is used.

Since with refrigeration only a limited period of storage is possible, use is made of freezing which assures conservation, for an unlimited duration, of foodstuffs the temperature of which has been reduced to below freezing point. After the 1914-1918 war, this system attained such a high degree of perfection that it cannot be done without in supplies economy, in fact, it has produced a complete change in the trade in rapidly perishable foodstuffs.

The technique of freezing which, in the beginning, was only applied to animal products, is now also employed in the conservation of fruit and vegetables.

The object of desiccating foodstuffs is to remove the water in which micro-organisms find a nutrient medium for their development. This method is applied chiefly to fish, milk, fruit and vegetables.

Milk began to be dried, first in open chauldrons, at about the middle of the 19th century. Subsequently the access of air was prevented. At present two fundamentally different processes which have been greatly improved in recent years, namely, desiccation by pulverization and film desiccation are used.

Fruits are dried either naturally (in the shade, in the sun), or artificially. Only artificial drying is employed in the case of vegetables. Their moisture content is reduced 9-12 per cent., beginning with a temperature of about 35°C. subsequently raised slowly up to 70-85°C.

The modern technique of vegetable drying is at the outset of a very pronounced development stimulated by present conditions.

The object of condensation is to render foodstuffs conservable by removing the moisture contained and forming highly nutritive concentrated products, the chief of which are beef extracts, yeast extracts and condensed milk. Before the present war, approximately 750,000 tons of milk were condensed every year in the United States and about 110,000 tons in Germany. Condensation is carried out in a vacuum after a preliminary heating of the milk with the addition or otherwise of a sugar solution.

The aim of filtering liquids with a view to their conservation is to eliminate noxious micro-organisms by passing the liquids through very finely porous filters. This method is particularly in demand for the preparation of sweet musts.

During the last few years the technique of pasteurization and the apparatus employed have improved considerably. It has become an industry the economic importance of which can clearly be seen from the statistical data already mentioned. It is known that the object of this process is to destroy noxious micro-organisms through the effect of temperatures carefully fixed and thus render the foodstuff conservable while at the same time amply maintaining its quality. Pasteurization is usually carried out at a temperature below 100°C., while for sterilization, higher temperatures (105–120° C.) are employed.

Pasteurization finds a practical application in home preserving, but to a still greater extent in the extremely extensive canning industry. For large

scale technical operation, complicated installations, meeting the increasing demands of present day food stocks, are required. Usually the farmer does not take a direct part in the canning industry. Indirectly, however, the canning industry is of great importance to farming because it purchases large quantities of meat, fruit and vegetables. It can, in fact, as will be seen further on, influence intensively the structure af the agricultural production of entire regions.

From the standpoint of both hygiene and of public economy, the pasteurization of milk is highly important and consequently, in various countries has led to the establishment of legal measures.

Apart from canned fish which does not interest the farmer as a producer, as regards lasting preserved produce, are considered first fruits and vegetables put up in tins, cans or glass receptables. For this industry also a complicated system of equipment has developed for cleaning and preparing the raw material, filling and sealing the containers, etc., which will not be discussed here.

(b) *Chemical methods*

S a l t i n g is a very old method of preservation, which draws out the water from the foodstuffs and thus deprives the bacteria of a favourable medium for their development. Also salt applied in large quantities has a toxic action on many bacteria and checks their growth.

Mostly animal products are salted.

In p i c k l i n g , mentioned earlier on, together with the salt, 1-2 per cent. saltpeter and some sugar are added to maintain the red colour of the meat.

C u r i n g is usually practised jointly with salting or pickling. The effect of smoking is to modify the odour and flavour of the meat and to render it conservable, primarily because it dries the product, but also through the action of bactericidal substances formed which destroy decomposition germs.

Keeping animal foods in contact with v i n e g a r checks the development of microbes. It is a popular household practice for keeping meat a few days. In the fish industry, acetic acid together with salt are used in the preparation of the so called marinated fish.

The a c i d i d i f i c a t i o n of milk, certain vegetable foodstuffs and forage crops may be considered as a chemical process as the keeping quality of the products is due to the action of more or less well defined acids; generally, however, these are not added artificially, but are generated through fermentation due to microbial activity. On that account, therefore, it is a question of a biological process.

In the first place mention should be made of milk acidification produced by the natural lactic acid forming agents which render the milk conservable by sharply increasing the acidity thus making conditions unfavourable for the agents which decompose the protein.

Delicate milk products of this type are now prepared (yoghourt, kephir, etc.) by means of pure cultures of bacteria, carefully controlling the course of fermentation.

The fermentation of white cabbage should also be considered as a microbiological phenomenon (preparation of sauerkraut), a very old practice which,

still today, plays an important role in the home as well as in small and large scale manufacture.

The aim of s u g a r i n g is to utilize the strong affinity of sugar for water so as to render conditions unfavourable for the development of noxious micro-organisms and thus protect the foodstuffs against attack. This process is applied primarily to the preparation of different types of preserved fruit (jams, jellies, candied fruit, fruit juices, etc.).

Mention has already been made of a l c o h o l which has long been known as a natural preservative. As product of fermentation, it renders wine and other fermented beverages conservable. Sometimes alcohol is also added to fruit juices, preserves, etc. to ensure them keeping.

O i l , heated before use, constitutes an unfavourable medium for the development of micro-organisms, consequently this property is utilized for many products (sardines in oil, etc.).

Besides the preserving agents already discussed, frequently certain c h e m i c a l p r o d u c t s are employed to increase keeping quality, in particular: benzoic acid, formic acid, sulphurous acid and several other inorganic or organic compounds. Mention has already been made of the protective gases utilized in refrigeration.

Recently, a n t i - o x i d a n t s have been used to prevent fats from deteriorating; either natural anti-oxidants (for example, oatmeal) or artificial (hydroquinone, for instance); they check the process of oxidation causing rancidity.

(c) *Irradiation, packing and wrapping materials*

The irradiation of foodstuffs with rays of a certain wave length opens up new possibilities for their conservation. Mention many be made, in particular, of the results obtained by the use of infra-red rays and ultra-violet irradiation in the disinfection and desiccation of cereals *. The action of ultra-violet rays on milk and yeasts as regards increase in vitamin content will be discussed in a subsequent article. It may be noted that the experience acquired with ultra-violet ray irradiation has led to extending its application to different products, particularly in view of their conservation. The newest type of lamps exert a powerful bactericidal action. They also produce undesirable effects, however, and consequently the fats have to be protected from the action of ultra-violet rays by special filters.

Substances which have the property of absorbing ultra-violet rays are used to impregnate the packing material and also for direct application to the foodstuffs themselves. In this way, the w r a p p e r s acquire a preservative property, which still further increase the protective effect (hermetic sealing excluding air and water) produced by the nature of the packing material. Parti-

* In this respect, see the article of E. GASSER and G. STAMPA entitled: 'New aspects on the drying and disinfection of cereals', in the *Monthly Bulletin of Agricultural Science and Practice*, 1940, No. 11, and 1941, No. 1.

cularly suitable for wrapping material are the many products of the cellulose industry (cellophane, etc.). As chemical protective substances with a bactericidal action, for impregnating the wrappers or for direct application to the outside of the food product, mention may be made of paraffin, wax, boric acid, sodium benzoate, etc. In this respect many new processes have been invented and patented in recent years.

III. Influence of preserving technique on agricultural production

Apart from the cases of the treatment of farm products on a cooperative basis, in general the farmer delivers his produce in the raw state, leaving to other enterprises the task of transforming it into elaborated food products. Thus the preservation of foodstuffs, their storage and maintenance are entrusted to economic centres outside agriculture. Though the farmer is not directly concerned in this activity, nevertheless, indirectly, it is of great importance to him. Thus, as seller of the raw produce, he takes into account directly the requirements of the wholesale buyer. Their reciprocal dependence creates common interests which promote a fruitful collaboration. Agriculture (in the wide sense of the term) has thus experienced far reaching consequences which have left their impression on the agricultural structure of certain countries and even of entire countries, and influenced in a decisive manner the tendency of its development.

The large number of small canning factories, and in particular, the conservation of foodstuffs and the formation of stocks in the farm itself, could, it is true, absorb largely and utilize advantageosly surplus products. The large scale canning industry, however, requires, owing to its developed organization and specialization, regular supplies in order to ensure uniform output, if it is not wished to have a sort of itinerant enterprise, as has frequently been the case in the United States, by establishing as required the canning factory, at the time of maximum production, in the producing regions, principle which has also been applied in Germany—the squads of workers employed for stewing potatoes for stockfeed.

The more highly developed the canning or preserving plant the more pressingly it demands a regular supply, as regards both quality and quantity. The consequences for the farmer were important, both technically and economically: adoption of suitable varieties, careful grading, graduated crop system, sometimes also special manuring and similar measures.

The primitive methods of conservation had no special requirements as regards the raw material; the products were utilized as they occurred normally. The improved methods of today, however, necessitate higher quality products, as, the more up to date the technique, the better it is able to maintain unaltered and durable the essential properties of the substance treated, and also the greater the requirements in regard to the quality of the raw material. Preserving therefore, contrary to general opinion, leads to good quality produce. Only through this industry is mass production of quality produce possible as it does away with the necessity of immediate consumption on the spot.

Collective alimentation, which is becoming more and more extensive, stimulates not only the canning or preserving industry as such, but also the control

of methods of operation and the rigorous selection of the raw material. The farmer, therefore, is confronted by a critical buyer and a control of his produce, which obliges him to adapt himself closely to the requirements in regard to the quality of the foodstuffs and hygiene. On the other hand, he is guaranteed a market for high priced foodstuffs also when produced in quantities greatly exceeding the momentary sales possibilities of the fresh goods. The canning industry guarantees him the possibility of intensifying and specializing his crops with all the inherent advantages.

The close interdependence between the preserving industry and agriculture is particularly evident from the change that has taken place in the meat market since modern conservation methods have been adopted for this foodstuff *.

Formerly, the poor keeping quality of meat constituted an obstacle for its transport over great distances and thus checked large scale production, especially in regions which were a long way from markets, even if production conditions, however, were advantageous. The old methods of conservation (salting, pickling, curing) had the disadvantage of greatly modifying the aspect and taste of the meat, and, moreover, could not be used for all kinds of meat. These conditions changed radically when the cold storage system was devised. The overseas countries favoured by climate and other factors (Argentina, Uruguay, Australia, New Zealand, South Africa) were then in a position to supply the European markets with a product having the character of fresh meat. The livestock production of these countries increased enormously and the European stockfarmer found himself faced with a new competitor which made adaptation to the new situation necessary. Subsequently, competition began in the group of exporting countries between those of South America, favoured by climate and geographical position, and the British Dominions, not so well placed, due to the fact that the former instead of freezing the meat adopted the system of chilling (temperature between 0^{0} and 2^{0} C.). In this way, the South American countries acquired an advantage which their competitors could not easily attain since they were too far distant to be able to transport chilled meat to Europe without it spoilling. Improvements in the chilling process and the results of the Ottawa Agreement (1932) enabled the production of the Dominions to come into full competition with the South American exporters on the English market.

In the Argentine Republic and Uruguay the progress accomplished in the technique of meat storage brought about a profound change in cattle stocks as regards breeds. The mediocre native breed 'Criollo' was substituted more and more by English early maturing beef breeds. Besides a remarkable improvement in the stock, this change assured the South American production an important advantage on the world market; the stockbreeding industry obtained full benefit from this storage technique by careful breeding and proper feeding.

Apart from the economic side of the question, it is important for the stockfarmer to know whether it is better to produce for frozen meat or for chilled meat

* In this respect, see the monograph entitled 'World production in meat', International Institute of Agriculture, Rome, 1938.

as, for chilling, more so than for freezing, first grade, or at least good quality meat is used. Consequently the stockfarmer was incited to produce quality beef while, at the same time, he was assured of a regular sale.

Before the present war, the European meat market demanded more and more a tender, not very fat meat, from young animals, a demand which the stock-breeder of the overseas countries could satisfy by means of chilled meat and to which the European stockfarmer had to submit willy-nilly. The outcome was that, for the majority of animals, the slaughtering age fell, within a short time, from 3-4 years to 1-2 years.

In England, a fact has often been remarked which well characterizes the influence of meat conservation on the habits of the farmer—he sells the fresh meat of his own production and himself eats chilled meat.

If the preservation of foodstuffs has mainly an indirect influence on animal production, on the other hand, it acts directly on plant production, owing to the fact that the farmer himself conserves foodstuffs on a large scale; mention should be made primarily of forage conservation, and in particular, of the revolutionary importance of ensilage. This subject, however, is outside the scope of this article which regards only the conservation of food products for man, and therefore we will now turn to the keeping of fruit and vegetables.

In this branch of agricultural production, the influence of preserving on the producer is chiefly indirect, as is the case with animal production. The fruit and vegetable producer supplies the raw material which is elaborated by enterprises foreign to agriculture. Producer and manufacturer form the links of a chain on the path of foodstuffs production; as such, they are bound to each other by the various reciprocal connexions of interdependence.

In the field of fruit and vegetable production, a close parallel can hardly be made with the afore-mentioned striking example of meat conservation in South America, which exerts a profound influence on the economic life of an entire country. Nevertheless, also in this field now under discussion, canning may determine the entire structure of agricultural production and industrial organization as is shown by the example of the pineapple canning industry in Hawaii and the canned and dried fruit production in California. In general, however, the effects of fruit and vegetable canning or preserving are more limited locally, which renders them all the more decisive and varied within the province of the respective canning centres. They enter deeply into the working of the farm and may even lead to the dependency of the grower on the canner.

As has already been seen, the canning or preserving industry assures the producer of the raw material the sale of his produce; however, the supply must be as regular and uniform as possible. As regards quality, the canning industry is just as exacting, if not more so, than the ordinary market for the fresh product, particularly in times of over-production. Frequently, special varieties are demanded. Sometimes, the industry itself procures the seed, gives instructions on cultivation and harvesting and supervises same. All this has important consequences, economically and technically, for the grower.

It is particularly difficult to meet the requirements of the canning industry which is not so elastic and accomodating as the dried products industry.

It is not easy to establish in advance the exact time of harvesting of a given area and the yield which will be obtained. This is why the supplying of certain quantities at graduated periods, determined beforehand, necessitates a considerable technical and organizing capacity on the part of the producer.

The adoption of varieties particularly suitable for preserving requires much time and a large capital, without counting the necessary special knowledge. In one species of fruit or vegetable, the diverse varieties behave very differently on canning. On the other hand, the origin of the product, fertilizers and other factors having acted on the plant during growth, influence the quality.

It goes without saying that the grower, being the weakest side economically, is easily exposed to an unjustified pressure exercized by the industrial canner. An endeavour is made, therefore, to assist and protect the growers by uniting them into professional associations. In Germany, the efforts aiming at delimiting equitably the rights and obligations of the grower and the manufacturer, at the same time guaranteeing public welfare, have led to the adoption of standard current supplies contracts between producer and manufacturer (cultivation and supply contracts) and to the prohibition (save exceptions) of sales on account. The ' Reich standard contract' for the cultivation and supply of vegetables indicates as obligations of the grower: cultivation of certain varieties on areas determined in advance—cultivation, harvesting and delivery according to the instructions of the manufacturer stated on the contract—delivery to the manufacturer of the entire crop, after grading according to the stipulations of the contract—exclusion of other buyers. For his part, the manufacturer undertakes to purchase all the product (up to a fixed maximum) and to pay, at the price established by the competent office, the amount due in four instalments, one being payable during harvesting. He is forbidden to cede to any third party the produce under contract not elaborated.

The ' general provisions regarding cultivation and supply contracts' regulates in every detail the relations between grower and manufacturer. For example, they oblige the grower " to obtain from the manufacturer, if he so desires, all the seed and plants required for the area under contract... and to employ them exclusivly for the area in question". The producer is required to inform the manufacturer of yields higher or lower than normal. He has the right to a supplement for warehousing expenses if the manufacturer does not take away all the produce within the period established. In general, the products are delivered as fast as they are harvested.

IV. **Present problems in food preservation**

1. Maintenance of quality

During the peace years which preceded the present war, special effort was made to maintain the quality of food products. In this respect (nutritive value, gustatory, dietetic and hygienic properties), the preserved product had to equal as far as possible the fresh product. The canning industry is particularly proud of its achievements in this field. Chilled meat undoubtedly represents a considerable advance over frozen meat, and it may be said that an analagous progress

has been made in all branches of food conservation. At first, however, difficulties were experienced in retaining the vitamins. In the program of the VIth International Congress of Agricultural Industries (Budapest, 1939), the 1st subject was " The production of foodstuffs rich in vitamins, with special reference to preserved fruits and vegetables". This question was decided in the favour of conservation to the extent that today, it may be affirmed that preserved fruits and vegetables, if prepared with all the care possible with the modern technique, have practically the same nutritive value as the fresh product (*).

In canned products carefully prepared (heating of short duration at a relatively high temperature, allowing no access to air), vitamin A is maintained in a good state of conservation. On the other hand, its content is much reduced through desiccation; however, with suitable modern drying apparatus, products can be preserved and still retain an appreciable part of this vitamin. The vitamins of the B complex are affected relatively little. It is the maintenance of vitamin C which is the most important; hundreds of works published throughout the world concur in stating that, in canned products, the amount of vitamin C depends on its percentage in the raw material and the cleaning and blanching of same. As this percentage depends greatly on the type of plant, evidently varieties with a high vitamin content should be employed. Its decrease is due primarily to oxidation, hence the necessity of treating the raw product as rapidly as possible, avoiding all excessive cutting up and cleaning. The blanching operation should be carefully directed and the liquor used to fill the cans. In this way, every endeavour is now made to maintain the vitamin C content in canned foods.

Desiccation causes appreciable losses (14-80 per cent.) in vitamin C; operating at a low temperature, however, a considerable proportion may be retained. Mention may be made of the process of the Danish engineer GERNOW, who compressed dry vegetables into blocks (' Orta Blok Gröntsager ') in which it seems that the vitamins are completely maintained, even after long storage.

An endeavour is also made with other methods to restrict loss in vitamins as far as possible. The high vitamin C content of pickled vegetables in comparison with that of other preserved vegtables may be noted. Sauerkraut, in particular, is an important source of vitamin C.

Contrary to the opinion held to date, cold storage also modifies the vitamin content of foodstuffs; nevertheless, this method is promising as regards the conservation of vitamins; for example, by this means, the usually very high loss in vitamin C which occurs in potatoes stored in winter, can be reduced by 50 per cent.

As regards vitamins D and E, the usual methods of preserving foodstuffs do not affect them in any way.

In regard to animal products, conditions are more favourable. Thus, in meat, with proper pasteurization there is practically no loss in vitamins; vitamin

* See the article of E. LELESZ, entitled ' Present aspects of vitamins in human nutrition', in the *Bulletin of Agricultural Science and Practice*, 1941, pp. 186-210.

A, however, undergoes a marked change. There is only a slight vitamin loss in condensed milk. Pasteurized and dried milk have practically the same content in B vitamins as the fresh product. In all cases, it is important to carry out all operations with care, applying practically the scientific principles of vitamin conservation.

A problem which has recently been attacked with success is the artificial enrichment of preserved foods in vitamins, so as to increase their proportion over that of the raw product; this enrichment is effected through the addition of concentrated extracts of vitamins A and C, obtained from strawberries, hip-berries, capsicums, etc.; synthetic vitamins, however, can also be used. This process acquires particular importance at the present time when alimentation becomes somewhat difficult.

Finally, mention may be made of the vitaminization of margarine as is practised and even prescribed in the Netherlands.

2. Importance of the conservation of foodstuffs under the self-sufficiency régime and in war economy

The present tendency towards self-sufficiency and market regulation finds in the preservation of foodstuffs an ally of inestimable value. A form of economy which purposely relinquishes the regulating action of prices varying according to supply and demand, requires another 'buffer' to act as shock-absorber. Fixed prices render absolutely necessary the creation of stocks to compensate for variations in production higher or lower than normal. For a country which aims at self-sufficiency of its own free will or owing to force of circumstances, the conservation of foodstuffs and the establishment of stocks are all the more valuable the less natural conditions favour autarchic provisions.

Under the influence of an enforced situation, the technique and practical application of food preservation has, in the last few years, made very rapid progress. The ensemble of questions to be solved and the field of application have extended to a remarkable extent, especially as regards war economy and, in particular, the revictualling of armies. War, always the scourge of peoples, but also their instructor, has stimulated the preservation of foodstuffs and the maintenance of stocks, arousing energy and thus exercizing a creative action. As was noted earlier on, Napoleon I, recognizing the military importance of preserved foodstuffs, offered a prize for any invention solving the question. In 1807, Appert was already putting up meat in glass containers for the French navy. Subsequently, extensive use was made of canned foods in the Crimean War and during the War of Secession in the United States. It goes without saying that a modern war involving the entire population and the entire political economy confronts food conservation with problems differing greatly from those in former wars fought chiefly with mercenaries. Without any doubt, among the conservation methods elaborated in view of war and during wartime, some will also be applied in the times of peace which will follow, and also for the benefit of humanity.

Apart from the partial or total interruption in communication with abroad, war involves a decrease in production and an increase in consumption, which

augment the importance of a regulated and controlled use of the products available and of those to be harvested suitable for conservation. In this case, it is not a question of realizing the ideal method, absolutely the best, but that which can best be applied at the time; this necessitates a skilful adaptation to actual conditions. Simple and rapid methods are required; use must be made of raw material even of mediocre quality, such as is available. Thus, for example, to prepare a first quality good-keeping sausage, in many countries today, there is neither the necessary time nor the type of meat required. First of all, however, consideration must be given to wrapping material and containers also subject to autarchic production; if they cannot be imported, recourse will have to be made to autarchic material. The type of material employed influences considerably the conservation of foodstuffs. Thus the shortage of raw material for water impermeable containers has led to preference being given to conservation through desiccation. A want of tin makes it necessary to turn to substitutes. On questions of this kind, at present, particularly in Germany, there is a literature which increases from day to day. As question of primary importance, having, therefore, to be solved first, that of containers today takes precedence over conservation itself, as the possibility of procuring them influences appreciably the development and execution of canning. Considerable information on the subject was obtained by visiting the exhibition of containers and wrappers for preserved foods organized at Parma (Italy) in 1941.

As new materials for containers, use is made of wood (composition wood or thin sheets of wood coated with artificial resin, paraffin, etc.) and of aluminium (plates having a protective coating preventing corrosion). An endeavour is being made, however, to employ primarily black sheet iron, excluding partially or completely the utilization of tin. The difficulties that sheet iron present—easy oxidation and impossibility of soldering it—have already been overcome to a large extent. In Germany, sheet iron cans and tins, soldered electrically, treated in a phosphate bath and coated with a protective cover, are already manufactured on a large scale. At present, the use of new materials for containers is in full swing.

Dried products are not so dependent on containers; however, the covering material available has to be taken into consideration. Thus, for example, in Germany, dried vegetables are packed not in paper but in sacks formed of two layers: an inner impermeable layer and an outer one in ordinary paper. For army use, the dried vegetables are compressed into cubes, then wrapped in cellophane, parchment paper or aluminium sheeting.

The large requirements and particular exigencies of military administration have given the canning industry an impulse and special character of its own.

The army demands primarily that preserved foods should weigh little and be of small volume. The new form of warfare, 'Blitzkrieg', with its independent motorized forces, parachutists and armoured tank divisions renders absolutely necessary large scale revictualling. The food provisions should not be bulky, should be easily transported, suitable for immediate consumption and provide a healthy, complete diet under greatly varying war conditions, namely, in the winter, in the tropics or in the desert. This explains the lively interest the military administrations take in the preserving industry and, in particular, in the ques-

tion of containers, and in the radical changes which have taken place in this field. Mention may also be made, besides the dried vegetable cubes already noted, of the concentrated vitamin extracts, automatic self-heating canned foods, canned bread, etc.

This advance in the canning or preserving industry, however, was opposed by different set-backs which reacted on agriculture. Thus, for example, the heavy losses in refrigerator ships necessitates the return to primitive freezing methods. On the other hand, the countries of North and East Europe, where the trend was bacon production for the English market, have changed to the production of fresh meat (chilled) and fat.

Such tendencies have to be closely followed in farming. A passive attitude cannot be taken before an evident development, whether momentarily appearing ascendant or descending, according to individual point of view. There is no doubt that the conservation of foodstuffs will continue to develop in the coming period of peace and agriculture must resolutely participate in this march on progress.

MISCELLANEOUS INFORMATION

Congress on olive-growing studies in Italy

The National Congress on olive-growing organized by the 'Reale Accademia dei Georgofili' in collaboration with the Olive-growing Branch took place in Florence on May 15-17, 1942, with the participation of the Minister of Agriculture and about a hundred experts from the different olive-growing regions of Italy. The International Institute of Agriculture was represented by a functionary specialized in the subject.

The proceedings of the Congress covered four important aspects of the olive-growing problem.

1. — BOTANY AND PARASITOLOGY OF THE OLIVE

Three papers were presented:—

(*a*) Prof. R. CIFERRI: *Recent progress in botanic-agricultural studies on the olive.*

The author expounds the principles of a new morpho-ecological classification of the olive cultivated in Italy. As a result of the early investigations carried out by the author, in collaboration with Professors Morettini, Marinucci and Breviglieri, it has been possible to establish a provisional analytical index of the different varieties of the olive cultivated, based on the diverse characteristics of the fruit, leaves and the tree.

(*b*) Prof. L. PETRI: *Recent progress in studies on diseases of the olive.*

Studies on the interruption which takes place in the development of the fruit and on pathological formations (small tubercles, ovules, hyperplasia) of the tree are of special interest. Prof. PETRI points out that this check in the growth of olives, which is a fairly widespread phenomenum, consists in the formation of a small drupe which, at a certain moment, ceases to develop, at the same time remaining attached to the peduncle throughout the period of fructification. The author examines the different causes which may determine this phenomenum and which can occasion serious damage to groves and he formulates the hypothesis, vary plausible, of the decisive influence of special conditions of nutrition, also in relation to the climate.

(c) Prof. F. SILVESTRI: *Recent progress in investigations on the insect pests of the olive.*

Important review of the principal insect pests of the olive, in particular *Dacus*, which every year produces heavy losses, both qualitative and quantitative to world olive-growing. The different control methods known up to the present (De Cillis, Berlese, Lotrionte, Martelli, Bertelli, De Luca and Russo), while having indisputable qualities have not always given completely satisfactory results from the agricultural standpoint. It would necessary, therefore, to effect, according to an organic plan, extensive experimentation on the biology of the *Dacus* and on the control of this insect.

2. — BIOLOGY AND CULTIVATION TECHNIQUE OF THE OLIVE

The following four reports treated on these questions:

(a) Prof. N. BREVIGLIERI: *Applications of investigations on the floral biology of the olive.*

The experiments recently carried out on this interesting and difficult problem have indicated that it is possible to improve nursery production by the industrial nurserymen employing strains better adapted and more suitable for cross pollination and fertilization, so that the olive-growers may select the best possible material for planting and production.

(b) Prof. M. MARINUCCI: *Recent aspects of olive pruning and manuring.*

The author points out the good results generally obtained in all the zones of Central and North Italy on millions of olive trees with the pruning methods of Roventini and Tonini (1) the application of which has enabled an appreciable increase in production. In regard to manuring, he particularly advocates the use of nitrogenous fertilizers for young olive trees as well as for old decrepit trees for rejuvenation.

(c) Prof. A. MASSACESI: *Aspects and problems of olive-growing in Tuscany.*

(d) Prof. A. MORETTINI: *Investigations on the root system of the olive-tree.*

Interesting study on the development of the root system of wild and cultivated olives under different climatic and pedological conditions, as well as at the diverse stages of the biological cycle of the plant. The development of the root system according to methods of propagation and planting, intensity and methods of pruning and cultivation systems is also studied.

3. — ELAEOTECHNIQUE

Three papers were discussed:

(a) Prof. G. FREZZOTTI: *Recent progress attained in elaeotechnique.*

Survey of the main advances realized within the last few years in oil technique, particularly in regard to the laceration of the pulp.

(b) Prof. F. MARIANI: *Trend of elaeotechnical experimentation.*

Examination of the technological aspects of the extraction of olive oil and the by-products, particularly in regard to the methods of centrifuging the paste, bringing into relief the mechanical and economic aspects which, for this question, present a greater importance.

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(1) See this *Bulletin*, 1936, No. 7, pp. 256-261.

(c) Prof. P. G. GAROGLIO: *Analaytical tests and investigations on olive marcs in Tuscany during the last five olive seasons* (1937-1941).

In this interesting report, attention is called to the opportunity of studying carefully the problems relative to the total exhaustion of the marc, which constitutes a material of the first order from which it is possible to obtain as by-product, many substances of high commercial and industrial value. The author communicates, in fact, that, in the course of his laboratory experiments, he obtained a charcoal of high calorific power which has special qualities and which may be included among the best natural products of this type.

4. — OLIVE OIL PRODUCTION AND TRADE

This interesting and well documented report presented by Dr. G. PAVONCELLI, President of the Olive-growing Branch and President of the International Federation of Olive-growing, treats amply on the *aspects and problems of the organization of olive oil production and trade in Italy and in the Mediterranean countries.* After having discussed the principal problems of olive-growing in the world and particularly in the countries of the Mediterranean Basin, he examines the consequences of the present conflict on olive oil production and trade and analyses the activity exercized during the course of the last few years by the International Federation of Olive-growing, created in 1934 at the International Institute of Agriculture. After examining the internal situation of olive-growing countries as regards the fats problem, the President expounds some basic considerations on the consequences which, on the one hand, the increased cultivation of oleaginous seeds and, on the other, the decrease in American imports of olive oil, will have on the development of olive-growing after the war. Olive oil, therefore, will have to be directed towards the countries of North and Central Europe. He then expounds the necessity establishing an International Information Bureau on the production and commercial trends of olive oil and oleaginous seed oil; of unifying export prices on common bases; of disciplining the production, classification of and trade in olive oil and finally, of creating a Mediterranean Centre for studies on the olive with headquarters at Rome and intended to centralize, according to a common organic plan, experimental work on the olive and its products.

The Congress adopted the following conclusions:—

(1) The Congress, considering with satisfaction the renewed activity in studies on the olive and on the oil manifested by the reports and communications presented, as well as by the practical progress realized, particularly in the field of elaeotechnique, nevertheless finds that in many aspects of olive-growing it is necessary to stimulate these studies still further with a view to elucidating fundamental questions (botanical, parasitological, biological, technical), especially in regard to pruning and fertilizers. The Congress vigorously recommends the Ministry of Agriculture and the Economic Association (' Ente') of Olive-growing to grant substantial financial assistance to all research initiative tending to obtain practical results in view of this development and improvement in production.

(2) Proposes the creation of a Mediterranean Centre for studies on the olive about which will be grouped—coordinating their work—the best technicians on the subject and the institutions concerned.

(3) Recommends the examination by competent bodies of the different propositions contained in the reports or communications or made after discussion.

(4) In regard to the question most discussed, namely the control of the olive fly, the Congress finds with regret that as yet there is no method of control which meets

general approval, nor delimitations or cultivation rules acceptable from the agricultural standpoint, although the damage caused to production is very severe. It affirms the necessity of realizing a powerful and coordinated effort to put an end to this state of uncertainty and to this end it estimes necessary:

(*a*) that studies on the biology of the insect should be still more exhaustive, taking into account the influence of different ecological environments, also insofar as regards control methods;

(*b*) that new control methods made practicable with the greatest care by the Economic Olive-growing Association ('Ente'), according to the program which will be determined by the Ministry of Agriculture, should be carried out in different ecological environments and that a Commission composed of entomological specialists and olive-growers should be entrusted with the interpretation of the results.

All the reports and communications presented raised keen interest and led to lengthy discussions which, on the one hand, well showed that some progress had been made in the technique of cultivation of the olive the extraction and full utilization of its products, but, on the other hand, proved that for many fundamental questions there is still uncertainty and confusion. It is for this reason that the Congress advocates the centralization and coordination in a Mediterranean Centre of all initiative, work and experience of technicians and of the institutions of countries interested in the full utilization and development of olive-growing as well as the realization of new and methodical studies, according to an organized plan of wide scope, in order to obtain an exact knowledge of the biology of the olive fly and of the most effectual methods of destroying this insect which causes such severe damage in all olive-growing parts of the world.

A. P.

BOOK NOTICES *

BACKMUND, Fritz: *Der Wandel des Waldes im Alpenvorland; eine forstgeschichtliche Untersuchung.* Frankfurt a. M., J. D. Sauerländer, 1941, 126 pp. (Schriftenreihe der Hermann-Göring-Akademie der Deutschen Forstwirtschaft, Bd. 4). — Price: 5 RM.

This work on the changes which have taken place in the forest of the Bavarian Pre-Alps constitutes the fourth volume of the series of publications of the Hermann Göring Academy of Forestry. The author shows the cause, the course and result of the changes which occurred in the Grünwald forest near Münich and, by means of this typical example, demonstrates the evolution of forests throughout the region comprised between the Alps and the Danube.

N. G.

VANSELOW, Karl: *Einführung in die forstliche Zuwachs-und Ertragslehre.* Frankfurt a. M., J. D. Sauerländer, 1941, VIII + 155 pp., 45 tables and 90 figures. — Price: 6 RM.

This introduction to the science of forestal development and output, recently authorized as a subject in the universitaries and as an independent scientific branch, provides the handbook which, until now, was wanting. In the numerous tables and diagrams, the practical worker finds varied information on the development of individual trees and stands, pure and mixed, on the production of types of vood and on the output of the different types.

N. G.

* Under this heading reviews are given of books presented to the Library.

SAVINI, Elia: *Caseificio. Il latte e la sua produzione*. Milano, U. Hoepli, 1942-XX, XX + 705 pp., 72 illustrations, CXXXII tables. — Price: 48 lire.

This work, the title of which signifies: Cheese-making, milk and its production, aims at constituting a treatise on cheese-making replacing that of FASCETTI (which resembled the basic treatise of BESANA and that of SARTORI), taking into account the new knowledge obtained through scientific progress.

After the first part on milk production, the author, in the second part, studies the composition and components of milk and discusses in detail, first the principal components: water – lactose – proteins – fat – salts – then the secondary chemical components, the biochemical components and cholostrum.

Experience and practice have shown that the cheese-maker should know from which animals the milk he uses is obtained. The third part of the work on the causes which influence milk secretion (ethnic, physiological, pathological, mesological influences and type of feed), supplies all the indications necessary for the present day cheese-maker, expounded in a clear and practical manner.

The fourth part on the physico-chemical properties of milk, describes first its organoleptic characteristics, then its physico-chemical properties, and concludes with an interesting chapter on milk and metals, in which the author studies successively the effect of milk on metals – the solubility of metals in milk (copper, aluminium, inoxidizable steel, nickel and its alloys, tin, iron, zinc, galvanized iron, lead). The influence of milk on the modern apparatus and utensils employed in the dairy and in the cheese trade and vice versa being of great importance, the writer gives this chapter the attention it merits.

This work is not limited to the study of cow's milk—which naturally constitutes the main subject—but also deals, in the fifth part, with the other principal milk-yielding species (buffaloes, ewes, goats, zebu) and their milk, furnishing the information indispensable to the cheese-maker without, however, encroaching upon the field of animal husbandry. This information, however, is all the more necessary in that Italian cheesemaking is not limited to the use of cow's milk only.

The sixth part, on milk production, supplies the data necessary to prevent the raw material changing, spoiling and even becoming polluted. The author treats the question in a series of chapters regarding respectively: stables—personnel and animals—milking—care in milk production—cleanliness of the utensils—collection of the milk—collecting centres—utilization of the milk.

The seventh and final part of this really up to date treatise concerns production statistics and the utilization of milk, giving data regarding Italy and also the whole world.

An appendix contains the Italian laws and regulations affecting milk and milk products.

This treatise on milk and its production represents the first volume of a more complete work, in which the subsequent volumes will be dedicated to milk derivatives.

Besides cheese-makers, this book can be advantageously consulted by all who are interested in milk and milk production. The studious reader desirous of probing still further some of the problems expounded and solved with masterliness by SAVINI, in his plain and clear style while at the same time being based on the latest conquests of science, will find an abundance of bibliographic references. The 72 illustrations and 132 tables make the text more intelligible not only to scientists but also to persons of average culture.

E. G.

Prof. UGO PAPI, *Segretario generale dell'Istituto. Direttore responsabile.*

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MONTHLY BULLETIN
OF
AGRICULTURAL SCIENCE AND PRACTICE

THE DEVELOPMENT OF THE FARM TRACTOR IN RELATION TO THE FUEL PROBLEM IN WAR-TIME

H. J. Hopfen

In the last few years which preceded the war, the motorization of farming increased rapidly. The beginning of war affected less the production of tractors than the fuel supplies in the countries separated from the world market. In this article, the influence of the fuel problem on the motorization of farming is studied and the attempts made to solve this problem on an autarchic basis are discussed.

Introductory

The growing use of internal combustion engines in every field of human activity causes a constant increase in fuel requirements, which, in the near future, will exhaust appreciably the mineral oil reserves of the whole world.

This and the fact that the sources of petroleum are concentrated in relatively few parts of the globe and belong to a few powerful groups of preponderant influence, have induced the countries poor in mineral oils, already in times of peace, to try to make themselves more independent as regards their fuel supplies, by utilizing their own sources of raw materials. During the war, this question has acquired a vital importance which necessitates obviating, by every possible means, the shortage of liquid fuels.

As substitutes for mineral oils, consideration should be given primarily to solid fuels such as wood, peat, lignite, pit coal, either in their original state, or after a transformation making them resemble as much as possible the petroleum derivatives.

The more these fuels are employed in the primitive state, the greater the necessity of adding complicated devices to the engine (gas-generators, gas purifiers) and of modifications to the engine, without, however, attaining the full efficiency of the ordinary liquid fuels. On the other hand, the more they can be transformed and improved before their use, the more simply the engine works, at the same time maintaining its usual construction and normal efficiency. The solution of the problem of motorization by the use of substitutes of mineral oils will be furnished therefore, in time, more simply and more advantageously by the transformation of the available solid fuels in a few large special factories, than by their gasification in the numerous complicated devices which charge the engine.

The simplicity of the operation of the engine is of decisive importance especially in the case of the farm tractor, which is usually employed under very difficult working conditions, so that it would not be compromised by supplementary loads and by a lesser possibility of efficiency. In view of this fact, and considering the importance of the tractor for the production of foodstuffs, at the beginning of the war, its use was modified or restricted as little as possible. The prolongation of the war, however, soon obliged the greater part of the countries deprived of the supply of liquid fuels to adapt themselves to existing conditions.

I. Effects of fuel shortage on farming

These effects first made themselves felt in France, where an endeavour was made to remedy the fuel shortage by turning to the construction of gas-generators greatly developed in this country. It was soon recognized, however, that the quantities available of wood and wood charcoal could not suffice for an increasing production of gas-generators, so that the manufacture of these apparatuses for home requirements had to be suspended as from June, 1941. This is why the efforts at developing producers for mineral charcoal have been redoubled and considerable progress, although these apparatuses are not yet perfected, has been attained. It is also proposed to overcome the deficiency of liquid and solid fuels by utilizing electricity to a greater extent in farming.

The fuel situation also proved very difficult in Belgium, the Netherlands, Denmark, Sweden, Norway and Finland, countries which all had to increase the use of gas-generators for agricultural motorization, facilitated in the Northern countries by their wealth of forests.

In Sweden, 9,000 tractors, chiefly the fairly large types had to be adapted to the use of gas-producers in 1941: in May of that year, 30,000 lorries operated with wood or wood charcoal gas-generators; the first type is now preferred to the second as with the direct gasification of the wood only half the wood is required than if it were first transformed into charcoal before use.

In Switzerland, the stocks of liquid fuels have become so low that the quantities assigned for farm tractors have had to be reduced appreciably. In farming this necessitates working to a greater extent with animal traction (particularly oxen) and adapting tractors to the use of wood or wood charcoal gas-producers.

In Germany, where the annual production of tractors amounted from 4,000 in 1935 to 30,000 in 1939, it has been possible in subsequent years to maintain more or less the production level attained at the beginning of the present war. The considerable increase, thus produced, of the number of tractors employed in farming during the war, as compared with what it was at the beginning of the outbreak, augmented the liquid fuel requirements, which it had been possible to meet without great difficulty up to the middle of 1941, while subsequently cases of shortage began to arise.

As in war-time, liquid fuels, owing to their easy handling, are reserved primarily for military use, even important branches of activity such as transports and farming, employing respectively lorries and tractors, have if necessary to

manage with other fuels, even if these make the work more complicated. For operating lorries, use had already been made previously of gas-generators; for the application of gas producers to tractors, decisive measures were only taken in this respect at the end of 1941.

An Ordinance of the managing director for German machinery production, dated October 23, 1941, prohibits, as from July 1, 1942, the manufacture of farm tractors of 25 HP or under, operated with liquid fuels (exception being made for machines intended for export). In their place, farm tractors of 25 HP worked solely by gas-generators will be manufactured.

Likewise from July 1, 1942, the manufacture of farm tractors of over 25 HP operated by liquid fuels is prohibited (this does not apply to the machines intended for export and those for the Russian occupied territories). In their place, farm tractors will manufactured, operated if possible solely by gas-generators or else according to the mixed Diesel-gas producer process (see further on, pp. 318-319).

It follows that in Germany, an endeavour is being made to solve the gas-producer problem less by an adaptation of the existing tractors than by the creation of machines expressly constructed for use with producer gas. For the existing tractors, adaptation is only anticipated in the second place, in the meanwhile, they continue to be worked by liquid fuels.

Practically, the application of the gas-producer leads primarily to the use of wood gas, although the use of wood charcoal and mineral charcoal gases should also be taken into consideration. In Germany, the exclusive use of wood charcoal gas is rejected because it involves a larger consumption of material than the direct gasification of wood. As regards the use of mineral charcoal gas, it is only beginning to develop and consequently cannot as yet be applied on a large scale. On the other hand, in the use of wood gas much experience has been acquired as it has been applied to vehicles for some fifteen years and advanced appreciably after 1930, when it was very difficult to dispose of wood on the market and when uses were sought and which appeared to be offered by the wood gas-producer. Since wood has become a much sought after raw material, however, at present the cause of the development then taken by the wood gas-generator no longer exists, without taking into account that the conditions for the use of gas-producers have changed.

II. **Wood supplies**

Today this question has acquired great importance for the use of gas-producer tractors utilizing wood. In the main, two sources of supplies should be considered, namely: (1) obtain the wood from the forests one possesses; (2) procure it through the intermediary of a wood distribution organization (as, for example, in Germany, the 'Generatorkraft', association which monopolizes the supply of wood for gas-generators).

Although from a superficial examination wood may appear as the fuel which is particularly suitable in farming (many farms owning forests), the fact should not be lost sight of that very numerous regions where the farms are highly mechanized do not possess forests, and that consequently they require, for their

gas-producers, wood which must be obtained from those regions with excess supplies; but wood, having a low calorific power, cannot support the expense of long distance freight. Moreover, even in Germany, the quantities of wood available are not sufficient for large scale supplying, so that now an energetic endeavour is being made to develop also a gas-producer for mineral coal, the supplies of which are better assured.

In the first place, it is proposed to employ the new tractors provided with gas-producers for wood, chiefly in the regions rich in forests, where the proprietors of these machines may obtain the wood themselves especially in the winter, for reasons regarding wood and work technique.

The wood for gas-generators should measure about 7 cm. in length and from 20 to 25 cm^2. for the cross section. Sawdust and wood-shavings should not be utilized for gasification, as these substances hinder the formation of the gases and increase fouling. On the other hand, there is no objection to using blocks of wood with the bark adhering. Increased humidity lowers the output appreciably. For a period of use of approximately 800 hours per year, a wood gas tractor tractor of 25 to 50 HP consumes 22 to 40 m^3 of air-dried wood. As, on an average, 30 per cent. of the timber cut annually are employed as fuel, it would be necessary, to maintain a wood gas tractor, to dispose of 25 to 30 ha. of forest, which, naturally, is not always the case.

III. General information on gas-producers

These apparatuses comprise the gas-generator properly so called, the gas purifiers and the mixer, the latter serving to mix the gas and air to be forwarded to the engine. In the generator the combustion takes place with the limited influx of air, in such a way that the fuel glows but does not burst into flame.

Distinction is made between descending gas circulation and ascending gas circulation, and either is employed according to the tendency of the fuel to form tar or not; thus the tarry fuels necessitate a descending circulation so that the tar burns in transversing the fire zone; on the other hand, the fuels which do not form tar are gasified in ascending circulation. These latter usually have a high ash content, and their formation into clinker on melting should be avoided as far as possible.

Before entering into the engine, the producer gas is freed from dust and ash in special purifiers, and also cooled. Purifier and filter constitute essential elements of the gas-generator apparatus, as they are indispensable for the running of the engine.

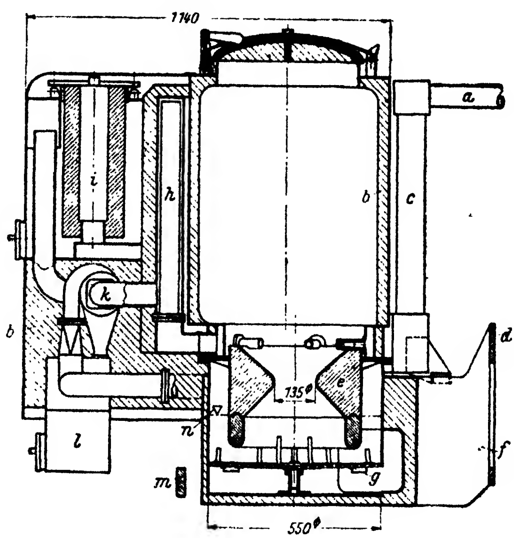
IV. Development and construction of the wood gas-producer

In order to develop a standard wood gas-producer for operating tractors, in Germany, in 1939, the Office for research on gas-generator tractors as a branch of the 'Reichskuratorium für Technik in der Landwirtschaft' was established. In agreement with the industrial establishments, this Office was put in a position to be able to utilize all the constructive details of the gas-generators already on

the market, with no respect to patents, in order to develop as far as possible the most suitable gas-producer. This research work led to the creation of a standard gas-producer (' Einheitsgenerator ') which gave excellent proofs of efficiency.

Intended for a tractor, this standard gas-producer is constructed as compact as possible: generator and purifiers form a whole which is installed in front of the engine, this arrangement having proved the most advantageous; in fact, it is that which least interferes with the view and which favours a good weight balance.

Standard gas-producer of the German Office for research on gas-generator tractors.



a = Pipe conducting the gas to the engine
b = Thermic insulation
c = Cooler
d = Connecting flange to engine
e = Firebrick furnace
f = Support plate
g = Revolving grate
h = Heat interchanger
i = Dust purifier with glass wool filter
k = Centrifugal purifier
l = Dust separator trap
m = Front axle of tractor
n = Level of wood charcoal

The work of the aforesaid Office has definitely proved that the heat balance of the gas-generator is of decisive importance as regards output of combustible fuel. This is why the gas generator and purifier are well insulated with glass wool. Also the air serving for gasification which enters into the gas-generator is previously heated by the exhaust gases in a special heat interchanger. In this way, the calorific power of the gases is increased appreciably and, practically even more important, fresh cut wood can also be employed as it can be well gasified with a moisture content up to 30 per cent. Naturally increasing moisture content diminishes appreciably the power of the engine, a point which will be discussed in detail further on.

The gas produced in the generator is first freed from the gross dust in a centrifugal purifier, then traverses the heat interchanger up to the fine dust purifier fitted with glass wool. Glass wool has given excellent results not only as an insulating material but also as a filter.

The generator with descending circulation is taken, in its essential elements, from the Imbert gas-producer which, when the existing installations were being

tested, showed particularly good properties. Four zones which are not definitely separated may be distinguished. In the upper part of the generator lies the desiccating zone where the wood is dried by the heat rising from the furnace. Immediately below is the zone where the wood smoulders. The gas which forms is oxidized by the influx of air in the so called oxidation zone, placed under the preceding zone. Still lower down, in traversing the 4th zone, called the fire zone, the non-inflammable gases are reduced, on contact with the incandescent coal, to combustible gases.

In the oxidation zone, part of the wood, therefore, is burned by part of the oxygen in the air drawn in, in order to produce the heat necessary for the other reactions of the gas formation. For its part, the air required for gasification is the cause of the low calorific power of producer gases; in fact, 4/5 of the air draw in are found again in the generator gases as incombustible ballast in the form of nitrogen. Consequently the lower the quantity of air required for the production of gas, the greater the calorific power of the gases obtained. This fact leads to reducing as much as possible the air requirement for combustion in the reaction zone, which can be realized practically by endeavouring to ascertain exactly and preventing as far as possible losses in heat in the generator.

The adverse effect of increasing humidity of the wood on the calorific power of the gases which form is due to the heat of evaporation employed to dry the wood and thus abstracted from the process of gasification. As the generated steam is split only to a small extent (approximately 14 per cent.) into its elements or rather gives rise, in the presence of incandescent coal, to hydrogen and carbon monoxide, and on the other hand, when the humidity increases, the carbon monoxide content of the gas mixture diminishes appreciably in contrast to a correspondly increase in the proportion of carbon dioxide, it results that the small gain in hydrogen cannot in any compensate the increase in heat consumption. Steam and nitrogen represent, therefore, in the formation of producer gas, an additional ballast which abstracts part of the heat necessary for gasification and, when the humidity of the wood increases, reduces the calorific power of the gases obtained, by promoting the formation of carbon dioxide. The steam contained in producer gas should be eliminated by cooling in the purifiers.

When the new standard gas producer was created, these facts led to reducing as much as possible losses in heat by insulating part of the receptacles and pipes and by utilizing part of the heat lost in the preliminary heating of the air serving for gasification. The decrease in loss in heat procured by these measures has in fact brought about an appreciable quality improvement in the output of the gasification.

Besides the reduction in heat losses in the generator, the prolongation of the processes in the reduction zone also plays an important part in increasing the calorific power of the gases. The sojourn of these in the fire zone, which only lasts a fraction of a second, is often not sufficient to exhaust completely the possibilities, offered by reduction, of obtaining an improvement in the inflammable gas. By prolonging the sojourn of the gases in the fire zone, it would be possible, for example, to reduce a larger proportion of the incombustible carbon dioxide into carbon monoxide, and the degree of decomposition of the steam

could also be increased, as it also depends on the duration of the reaction. An endeavour has been made recently to take this fact into consideration as follows: after the gases have traversed the fire zone (which cannot be enlarged, in order not to increase the consumption of wood serving only to produce heat), they are then passed externally around this zone in an annular pipe which surrounds the narrow part of the furnace. The charcoal dust drawn along, in settling on the incandescent wall of this pipe, aids still further in prolonging the process of reduction.

V. Mineral coal gas-generators

Compared with wood gas, the use of mineral coal gas presents some advantages, which consist chiefly in the greater calorific power of coal and easier obtained supplies. In Germany, it is proposed to charge the majority of the gas-producers in the future with mineral coal and, subsequently, to construct gas-generators which can be operated utilizing impartially either wood, mineral coal or even other solid fuels and their different mixtures. It has not yet been possible, however, to realize this project: the special nature of coal necessitates a gas-producer differing essentially from a wood gas-producer. Several types of this coal still involve fairly considerable difficulties as regards gasification, so that, up to the present, this process can only be carried out with a fairly limited number of mineral coals, selected primarily among those which contain relatively little ash, tar and sulphur.

Because of their ash content, mineral coals are gasified chiefly in ascending circulation, contrary to wood, which is gasified in descending circulation in order to burn the tar. With the latter system, mineral coal would very rapidly form clinker; even with ascending circulation, it is very difficult to prevent the ash forming clinker, as it fuses at temperatures nearly always lower than the temperature of the furnace. The injection of steam disintegrates the ash in fusion, which then rapidly cools and forms a granular deposit.

Mineral coal which does not contain over 3 to 6 per cent. ash is suitable for gasification. Many coals, however, have a higher ash content, and this defect is corrected by appropriate preliminary treatment, which makes it possible to obtain a fuel with not more than 2-3 per cent. ash in the coke. Lignite also furnishes a coke very suitable for gasification, provided that it contains little ash and sulphur.

The majority of mineral coals contain a certain quantity of volatile substances which are liberated at high temperatures in the generator (degassing) and which mix with the components of gasification. The gases liberated through degassing are rich in calories and thus increase the calorific power of the gases formed by gasification. During the course of the reactions, the mixed process of gasification + degassing is transformed into a simple process of gasification, because that of degassing is achieved more rapidly and thus a diminution in the calorific power of the gas obtained is produced.

To obtain a gas of uniform quality, the degassing of the fuel before its admission into the furnace should be avoided, all the more so in that non-degassed fuel has a greater power of reaction than that previously degassed. This object is

attained when the gas furnished through gasification no longer emerges above, but laterally, just above the fire zone. If the gas escapes slowly, only the fuel in the fire zone is degassed, but not in the others above this zone.

Besides the premature degassing they produce, excessively high temperatures in the gas-generator decrease the reaction capacity of the fuels (which also depends on the size of the grain and surface condition).As far as possible, therefore, these temperatures should be avoided, the more especially as they promote the formation of noxious substances which are difficult to eliminate.

In gasification, the gas formed always carries along particles of fuel and ash, tar, sulphur compounds, finally water and other impurities, which must be removed as far as possible by means of purifiers.

It is not possible to fit tractors with special tar separators like those employed in stationary plants. To maintain deposits of tar within tolerable limits, it is necessary, therefore, to use only those fuels which have a low tar content and above all to avoid those which contain tars liable to harden on cooling and thus capable of blocking the engine and the valves, preventing their working. On the other hand, tars not liable to harden, cover the pipes with a glutinous layer which catches grains of dust and which must be destroyed from time to time by burning.

What is more difficult, is the elimination of chemical impurities due to substances, in particular sulphur and its compounds which exercise a corrosive action after cooling of the engine. An endeavour is made to dissolve the greater part of these extraneous substances in water; but this must be changed frequently as it rapidly becomes saturated with the substances in question. Owing to this disadvantage, the sulphur content of fuels should not exceed a maximum of 1 per cent.

Finally, before entering the engine, the gas has still to be freed from the steam by cooling to 50-40°C., which also has the purpose of increasing admission of the air+gas mixture into the engine cylinder.

VI. **Properties of producer gas**

This gas is composed chiefly of: carbon monoxide, hydrogen, methane, carbon dioxide and nitrogen. The active constituents are; carbon monoxide (approximately 25 per cent. of the volume of the gas), hydrogen (about 13 per cent.) and methane (approximately 2 per cent.), while the carbon dioxide (about 8 per cent.) and nitrogen (about 52 per cent.) represent the inactive ballast. The ratio between the proportion of carbon monoxide and that of carbon dioxide depends greatly on the humidity of the fuel employed. The greater the increase in humidity and, consequently, in the heat expended to evaporate it, the more the said ratio changes to the detriment of the carbon monoxide.

The following table indicates the properties of different fuels and the producer gas they procure, particularly in relation to their calorific power and compares them with those of other fuels.

In general, producer gas has a calorific power of 1100 to 1400 kcal. per m³; but under unfavourable working conditions it may fall to approximately 800 kcal. per m³; 1 kg. of wood produces 2-2.5 m³ of generator gas; 1 kg. of wood charcoal

Properties of different fuels.

(The data on gases refer to atmospheric pressure and at 15° C.)

Fuels	Calorific power	Volume of gas or gasified fuel	Calorific power of gas	Ratio of mixture		Calorific power of gas + air mixture	Fuel consumption
				Air: volume of gas	m^3 air: kg. fuel		
	kcal. per kg.	m^3 per kg.	kcal. per m^3			kcal. per m^3	kg. per HPh
Solids:							
Wood (air dried)	2900-3800	1.9-2.5	See below, in relation to producer gas				0.8-1.2
Wood charcoal	6800-7500	4.5-5.5					0.4-0.5
Coke	5400-7200	3.5-5.0					0.5-0.8
Anthracite	7800-8200	5.5-6.0					0.4-0.5
Gases:							
Producer gas	1100-1400	1.000	1100-1400	1-1.2	—	550-600	—
Carbon monoxide	2440	0.870	2800	2.4	—	830	—
Hydrogen	28700	12.100	2360	2.4	—	700	—
Methane	11900	1.530	7820	9.5	—	745	—
Acetylene	11600	0.940	12360	11.9	—	960	—
Illuminating gas	9000	2.000	4500	5.2	—	740	—
Liquids:							
Petrol	10200-10600	0.220	48000	57.0	12.7	830	0.23
Gasoil (for Diesel engine)	10000	0.200	50000	60.0	12.2	820	0.20
Alcohol	6400	0.650	9800	11.7	7.6	770	0.28-0.32

produces, according to circumstances, as much as double and even more. For combustion in the gas producer, the wood requires 3 m^3 of air per kg, while wood charcoal and anthracite need 7.5 m^3 and over per kg.

That which is of particular importance for engine efficiency is the calorific power of the gas + air mixture: in producer gas where, at a maximum, it attains 600 kcal. per m^3, it is much lower than that of other mixtures indicated and gives rise to the aforesaid decrease in engine power of about 30 per cent. when operating with producer gas instead of liquid fuels. The lower calorific power may be compensated up to a certain point by increasing the rate of compression in the motor cylinders, as generator gas is very compressible owing to its high anti-knocking power. However, compression should not be increased too far, otherwise it would be necessary to reinforce different parts of the engine. Although generator gas can support a rate of compression attaining 1:15, in a petrol motor, the highest is 1:8 (the rate of compression is from 1:4 to 1:4.8 for petrol — 1: 7.5 for alcohol — 1:2.5 for acetylene — 1:5 for illuminating gas — 1:14 for gasoil in Diesel engines).

In the transformation of energy into gas, 25-30 per cent. of the energy utilizable by the engine are lost, that is, the engine works with an output of between 80 and 65 per cent. As in the explosion motor, approximately 24 per cent. of the initial calorific power of the producer gas are transformed into mechanical work, in the working of the gas producer, a total efficiency between 16 and 19 per cent. results.

Generator gas is very slow to ignite, therefore the time of ignition in the engine has to be advanced considerably. The special properties of this gas, therefore, necessitate making various changes in the petrol motor. Even taking account of these adaptations of the motor to the peculiarities of the working of a gas producer, it is necessary to calculate for this latter, a decrease in efficiency of from 20 to 25 per cent. as compared with operation with liquid fuels.

VII. Mixed Diesel-generator gas process

The low calorific power of producer gas, its slow ignition and small air requirement make it as yet impossible to use it alone for working the Diesel engine. It is quite out of the question to think of transforming Diesel engines into explosion motors to be run by producer gas because of the expenditure of material, time and work this change would necessitate.

As, these last few years, heavy farm tractors have generally been fitted with Diesel engines, in Germany, the new trend came up against this dilemma: either stop completely producing Diesel tractors and put out of service numerous work machines used in manufacturing the tractors, thus rendering subsequent production impossible for many factories owing to want of new work machinery apparatus; or else, maintain active the manufacture of Diesel tractors and assure, for their operation, sufficient quantities of gasoil. The second solution was adopted, after it had become possible to economize Diesel fuel appreciably by combining the use of generator gas with the working of the Diesel engine. In this mixed Diesel-producer gas or 2 fuel process, the motor draws up in the cy-

linder the producer gas + air mixture in place of air for combustion and compress it to the usual rate of compression of the Diesel engine. Subsequently, the quantity of Diesel fuel just enough to ignite the aforesaid mixture is injected. This injection serves not only to ignite the mixture in the engine, but also to increase its calorific power, so that the Diesel operates, without diminution in efficiency and without changes in the engine, economizing approximately 70 per cent. of the liquid fuel, replaced by generator gas. In other words, in operating the Diesel motor with the mixture in question, only 30 per cent. of the quantity of Diesel fuel normally employed are required.

VIII. Use of acetylene for enriching producer gas

The intention which inspired the process just described, namely, of improving the effect of generator gas of low calorific power by adding fuels having a higher calorific power, has also led to another solution which was discovered and utilized chiefly in France.

The fact that the gas emerges from the generator with a steam content which has to be eliminated before it enters the motor, has been turned to account in order to enrich it in acetylene. In fact, if a receptacle containing calcium carbide is interposed between the gas generator and the purifier, the steam contained in the producer gas, coming into contact with this carbide, will form some acetylene, according to the following equation:

$$(1)\ \underset{\text{Calcium carbide}}{CaC_2} + H_2O = \underset{\text{Acetylene}}{C_2H_2} + CaO$$

$$(2)\ CaO + CO_2 = CaCO_3$$

As the carbon dioxide is a gas which has already burned and therefore no longer possesses calorific heat, its partial fixation by the lime to form calcium carbonate in reality results in enriching the producer gas still further. The quantity of acetylene which is added to this gas does not exceed 3 per cent., consequently there is no risk of explosions. It augments the efficiency of the engine by 15 per cent. and even more. Also, the high velocity of ignition of acetylene counterbalances the slow ignition of producer gas, so that it is no longer necessary to advance the ignition in the engine. On the other part, the low compression capacity of acetylene diminishes that of the generator gas, consequently it is no longer necessary to modify the rate of compression when changing from operation with liquid fuels to that with producer gas + acetylene and vice versa, and also the efficiency of the engine remains practically normal.

This process, however, consumes a fairly large quantity of calcium carbide, which would make the tractor already loaded with the gas-generator heavier still.

IX. Comparison between the gas-generator tractor and the ordinary tractor

The following differences may be observed between the first type of tractor and the second:

(1) The generator loads the tractor with a supplementary weight and needs room to be mounted onto the frame.

(2) The use of a gas-generator decreases the output of the engine, generally to the extent of 20 to 30 per cent. of normal efficiency.

(3) Owing to the time required for heating the generator the use of the gas-producer retards starting of the tractor.

(4) The gas-producer adapts itself with difficulty to the variable requirements which succeed rapidly during work.

(5) The gas-generator tractor necessitates greater care and upkeep than the ordinary tractor, which also increases the demands required of the driver of the tractor. With this additonal work, satisfactory operation can only be expected with conscientious and well trained workmen.

The price of a gas-producer tractor is appreciably higher than that of a tractor driven by liquid fuels. It is not possible, therefore, to ask the farmer to change from an easily handled machine to an awkward machine operating much less cleanly, without reimbursing him, at least in part, the excess expense imposed by this purchase.

In fact, different countries where this problem is of present interest, grant, for the purchase of gas-generator tractors or for the adaptation of the existing tractors to use with gas-generators, official subsidies which generally amount to 2000-3000 Swiss francs per tractor (according to size).

X. Use of acetylene ammonia as substitute for petrol

Here we return to the starting point of our study, according to which a satisfactory solution of the fuel problem on an autarchic basis will be found in fuel transformation rather than in the machine itself. The pressure of present circumstances undoubtedly prevents turning exclusively towards the first trend, as it is easier and, for the moment, more economic to apply to the different tractors gas works in miniature in the form of gas-producers than to construct, for the refining of crude fuels, extensive costly factories, the planning and realization of which would necessitate a large capital and much time.

In this respect, however, mention may be made of the research work and practical results obtained. Apart from the known processes of coal hydrogenization, attention should be called to a new liquid fuel invented in France.

In endeavouring to render alcohol more effective as a motor fuel, for some years, the possibility of enriching it with acetylene has been considered. Under a pressure of 10 to 12 atmospheres, approximately 80 litres of acetylene can be dissolved in 1 litre of alcohol, thus bringing up the calorific power to 6000-6600 kcal. Under this pressure, the acetylene in solution is not explosive, on the other hand, the gaseous phase, which is produced in the receptacles in proportion as they empty and as the pressure diminishes, is explosive, so that the use of this mixture is not without danger and has been abandoned. Continuing experiments on the subject, it was discovered that acetylene dissolves still better in ammonia than in alcohol and gives a solution which takes away from acetylene its explosive nature and, in return, confers on ammonia the possibility of burning which it does not possess in ordinary air. In propagating ignition rapidly and vigorously, the acetylene produces a complete combustion of the gas mixture in

the engine and thus assures a good degree of efficiency. In fact, the output of 1 kg. acetylene ammonia would correspond, with 6000 kcal., practically to that of 1 litre of petrol.

The combustion of acetylene ammonia is effected with a volume of air not exceeding 5 times its own, while it has to be 57 times greater for petrol.

Experiments have shown that 78 per cent. by weight of ammonia + 22 per cent. acetylene constitute a suitable mixture, in which the acetylene is dissolved under a pressure of 10 atmospheres. On evaporation, the gas mixture then contains 33 per cent. acetylene and is not explosive. Recently in France, steel cylinders containing acetylene ammonia under a pressure of 40 atmospheres have been put on the market.

XI. Gas-producers for acetylene ammonia and methane

Taking as a basis the results obtained in France with acetylene ammonia, Dr G. Stampa (Italy) proposes a new process which is briefly described here:

He turns to account the fact that, on contact with water, calcium carbide forms acetylene, cyanamide gives rise to ammonia and aluminium carbide liberates methane. According to the author of the process, a compressed mixture of these three substances containing, by weight, approximately 1 part calcium carbide, 1.5 part of cyanamide and 0.5 to 0.8 of aluminium carbide, would furnish a good motor fuel which, needing only contact with water, only requires a simple, relatively small generator. The gases obtained being almost pure, there is no necessity for special purifiers. The residuum of the reactions forms flocculent deposits which do not incrust the walls of the gas-producer and thus can be easily removed.

Conclusions

To sum up, it may be noted that during the course of the last few years, and particularly under the pressure of fuel supplies, at present so difficult in many countries, attempts have been made, in order to solve the problem of tractors and fuels, at finding the most diverse solutions, which may become important also in the future. For this to be realized, fuels should be adapted to the simplest type of engine and not the engine to the most primitive fuel, as the extensive use of substitute fuels supposes that they can be handled in the same way as the fuels employed up to the present, or in a similar way, in other words that they are fluid at ordinary atmospheric pressure or at least at a very slight overpressure.

The present gas-generators for farm tractors should be considered more or less as an expedient. Seeing that their total degree of efficiency does not exceed 16 to 19 per cent. of the primitive calorific power, the question is raised, especially with regard to the very recent development of the mineral coal gas-generator, as to whether a suitable steam engine with condenser would not give the same results with a simpler construction.

In any case, one thing is sure: despite the enormous difficulties the use of motor machinery in farming involves, there has been no reversion to more or

less primitive forms of traction, as was observed momentarily during previous crisis periods. One turns more readily to mechanical work become more complicated, because one cannot, nor no longer wishes to forego it. This fact opens up for the future, after the war, prospects for the use of motor machinery in agriculture which eclipse all which has been attained to date in this field.

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LIST OF AGRICULTURAL FILMS IN THE VARIOUS COUNTRIES

The XIVth General Assembly of the International Institute of Agriculture, held in Rome from May 23 to 28, 1938, in its Resolution No. 8 requested the Permanent Committee "to publish periodically a list of films to be notified to the member Governments on the basis of the ideas exchanged in the course of the discussion".

At the Institute's XVth General Assembly (May 20-23, 1940), this desire was confirmed in Resolution No. 15, which recommended that "the compilation of a list of agricultural films existing in the various countries should be actively continued by means of the survey now being effected by the Technical Service".

The discussion shows that the purpose of this list is to facilitate direct interchange between countries desirous of borrowing films.

The purpose of the survey now being carried out by the Technical Service is to compile a list of films published since January 1, 1935, and to supply in each case information concerning content, length and technical features.

Owing to present conditions the continuation of the survey became first difficult and then practically impossible. A certain amount of information has, however, been collected and no purpose would be served by delaying its publication.

Although incomplete, the work already done may serve as a basis for further progress, even if the manner of presentation differs slightly from one country to another, according to the way in which the information was furnished.

The title of the films is given first in the original language, followed by the English translation. It has been adjusted in cases where the title contained a play of words or a double meaning.

GERMANY (1)

FILM TITLE	SUMMARY
I. — FILMS REFLECTING THE TECHNICAL ASPECTS OF AGRICULTURE	
A. — CROPS	
Wirtschaftseigener Dünger (*Farm manures*)	Importance of manure. Liquid manure. Compost. Artificial manure. Green manure.
Kraftfutter aus eigener Scholle (*Concentrated feed for livestock produced on the farm*).	Concentrates produced by means of colza and flax crops, catch crops and an increase in root crops.
Schliessung der Fettlücke (*Elimination of fat shortage*).	Measures for increasing the output of fats by autarchic means,
Warum Stapelmist und wie? (*Good manure. Why and now?*)	Construction of manure heaps according to instructions; piling of manure.
Wiesenumbruch (*The breaking up of grassland*)	The breaking up of permanent grassland.
Kampf dem Unkraut (*Weed control*).	Weeds most usually found in fields and among crops and control methods.
Deutscher Mais (*German maize*).	Cultivation and harvesting of maize.
Die Süsslupine (*The sweet lupin*).	Selection of the sweet lupin. Treatment and control of selected seed. Cultivation. Upkeep. Harvest. The sweet lupin as a catch crop. Milling of the sweet lupin seed.
Deutscher Flachs (*German flax*).	Cultivation and harvesting of flax.
Hanfanbau und Hanfverarbeitung (*The cultivation and preparation of hemp*).	Cultivation, harvesting and utilization of hemp.
Achtung! Kartoffelkäfer! (*Look out! Here comes the Colorado beetle!*).	Measures for preventing and controlling the Colorado beetle.
Raps bringt Fett, bringt garen Boden, bringt Eiweiss (*Colza produces fat and albumin; it leaves the soil in good condition*).	Cultivation. Care. Harvesting and utilization of colza.
Eiweissfutter durch Silage (*Fodder albumin through ensilage*).	Treatment of green fodders which are rich in albumin by adding acids for the preparation of ensilage.
Das Dauerversuchsfeld (*The permanent experiment field*).	Instructions for the correct preparation of an experiment field.

(1) Communicated by the Ministry of the Reich and Prussia for Supplies and Agriculture to the International

GERMANY

Publisher	Producer	Length in metres		Synchronized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
Reichsnährstand	Commerz-Film AG.	585	232		+	10-12-1936
»	»	682	273		+	14-12-1936
»	»	528	211		+	19-12-1936
»	»	1015	401		+	1-11-1937
»	»	510	203		+	27-10-1937
»	»	721	289		+	21-12-1937
Maisanbau-Ges. (*Maize-growing Association*)	Stoecker-Film AG.	1252	594	+	+	16- 4-1935
S. E. G. (*Sweet lupin producers' Company*)	UFA		385		+	21- 2-1936
Flachsanbau-Ges. (*Flax-growing Association*)	Stoecker-Film AG.	540		+		21- 2-1936
			217	+		21- 2-1936
			256		+	7- 3-1936
Deutsche Hanfbau-GmbH (*German Association for the cultivation of hemp*).	KIFO-Hellmut Bousset	642			+	2-12-1937
		545		+		17- 2-1938
			257		+	2-12-1937
			213	+		17- 2-1938
Reichsnährstand	Herbert Kebelmann	452	182		+	25-10-1937
Chemische Fabr. Kalk	Chemische Fabr. Kalk		233		+	12- 3-1935
»	»		165		+	12- 3-1935
Dtsch. Kalisyndikat (*German potash syndicate*)	UFA	780			+	2- 1-1936

GERMANY (*continued*)

FILM TITLE	SUMMARY
Arbeit über Kalidüngung (*Work with potash fertilizer*).	Work of the agricultural research station belonging to the German potash syndicate.
Der Kartoffelbau (*Potato growing*).	Origin of the potato. Preparation of the soil. Rational manuring. Planting. Cultivation. Care. Pest and disease control. Harvesting Storage.
Vom Bergwerk zum Bauern (*From the mine to the peasant*).	Geological constitution of potash salts. Exploitation of the mines. Processing down to the preparation of the finished product.
Salz des Lebens (*The salt of life*).	Extraction of phosphates, their treatment with nitrate for the preparation of fertilizers and their use in agricultural practice.
Flachs und Hanf (*Flax and hemp*).	Importance of the cultivation of textile plants from the standpoint of national economy. Cultivation. Manuring. Harvesting. Production of oil and presscake. Processing of fibre by hand. Industrial utilization. Uses in the household, national economy and in the army.
Fruchtbringende Erde (*The fruitful soil*).	Maintenance of soil fertility. Raw phosphates and the production of Rhenania phosphates.
Frischer Wind aus Streudorf (*New ideas from Streudorf*)	Research Station of the Association of producers of Thomas slag. Production of Thomas slag.
Umstellungsmassnahmen in der Stalldüngerwirtschaft (*New measures as regards farm manure*).	New measures for the preparation of farm manure.
Achtung Kartoffelkäfer (Neu!) (*Beware of the Colorado beetle*) (*New*).	Preventive measures and campaign.
Die Feinde des Getreide- und Futterbaues und ihre Bekämpfung (3 Teile) (*Pests of 4 cereal and fodder crops and their control*). *In 3 parts.*	Plant and animal enemies of cereals; efficient means for attacking them.
Die Hackfrüchte und ihre Feinde und ihre Bekämpfung (2 Teile) (*Pests of root crops and their control*). *In 2 parts.*	Measures against the principal diseases of root crops; methods adopted in the campaign to fight them.
Fortschrittliche Weidewirtschaft (*Progressive exploitation of meadows*).	Increase and improvement in the output of grazing land by means of mowing and pasturing. Division and rational exploitation of grassland.
Mehr Hackfrüchte mit weniger Arbeit durch Vielfachgeräte (Fassungen *A* und *B*) (*More root crops with less labour by adopting multiple-use machines. Editions A and B*).	Methods for economizing labour by the adoption of multiple-use machines. (*A*) Usual conditions of the potato crop. (*B*) Conditions of potato crop in South Germany with the adoption of ridging.

GERMANY (*continued*).

Publisher	Producer	Length in metres		Synchronized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
Dtsch. Kalisyndikat	Dtsch. Kalisyndikat	506	204	+	+	28- 7-1936
»	Dtsch. Kalisyndikat	1120	450		+	9-11-1936
»	»	771 972	 389 310	+ +	 +	23-10-1937
Chemische Fabr. Kalk	Stoecker-Film AG.	446	179	+		11- 1-1938
Dtsch. Kalisyndikat	Dtsch. Kalisyndikat	994	396	+		14- 1-1938
Kalichemie A. G.	Tiller-Film	1205	483	+		January 1938
Verein der Thomasmehlerzeuger (*Association of producers of Thomas slag*).	Döring-Filmverke AG		574		+	January 1938
Reichsnährstand	Landesbauernschat Schlesien	720	519		+	8- 3-1937
»	Herbert Kebelmann	722	289		+	5-11-1938
»	»	785	310		+	21-11-938
»	»	646	258		+	21-11-1938
»	Commerz-Film AG.	1116	447		+	21-11-1938
»	KIFO Hellmut Bousset	A 938 B 882	372 355		+ +	29-11-1938

GERMANY (*continued*)

FILM TITLE	SUMMARY
Raps-und Rübsenbau (3 Teile) (*The cultivation of colza and rapeseed. 3 parts*).	The need for increasing the colza crop as a source of fat. Preparatory work and upkeep.
Arbeitsemechterung-Leistungssteigerung durch zweckmässige Arbeitsverfahren und Maschi neneinsatz (4 Akte) (*Easier work and higher output by using rational labour methods and machines. 4 parts*).	Preparation of the soil. Cereal crops. The potato crop. The beet crop.
Gesunder Boden – hohe Erträge (6 Teile) (*Healthy soil – high outputs. 6 parts*).	Origin and composition of the soil. Life in the soil. Working the soil. Necessary conditions for an increase in output.
Auf das Saatgut kommt es an (*The part played by seed*).	Explanation of the value and quality of selected seed.
Deutscher Boden (*German soils*).	Importance of soil taxation.
Etwas über Almwirtschaft (*Alpine economy*).	Pictures of harvest-time in the Alps. The grape harvest. Packing of fruit. Development of mountain livestock. The daily round on an Alpine farm.
Der badische Schwarzwald und seine Weiden (*The Baden Black Forest and its pastures*).	Poor grazing land is transformed into pasturage giving a high yield by means of breaking-up the soil, new sowings, parcelling out, manuring and regular care.
Der Gutsbetrieb Limburger Hof der I. G. Farben AG. (*The 'Limburger Hof', run by the I. G. Farben A. G.*).	Measures adopted with crops, dairy production and livestock in order to obtain maximum output.
Neuzeitliche Weidewirtschaft (*The new method for the exploitation of grazing land*).	The adoption of this method leads to higher and steadier yields, producing fodders rich in albumin for winter feeding.
Der Schollekraft (*The power of the soil*).	Methods and ways of contributing towards victory in the output campaign.
Bilder aus den Stickstoffwerken der I. G. Farben AG. (*Pictures from the I. G. Farben AG. nitrate factories*).	Equipment in the Oppau and Merseburg factories, showing how ammonia is transformed into fertilizer.
Wirtschaftseigenes Kraftfutter durch Einsäuerung (*Fodder concentrates produced on the farm itself by means of ensilage*).	Animated pictures showing the chemical transformations which take place in the silo.
Die Not eine Quelle der Kraft (*Necessity is a source of strength*).	The introduction of catch crops is a new stage in progress.
Futtergewinnung im Eigenbetrieb (*Fodder production on the farm*).	Modern technical methods adapted to grazing land leading to a general improvement in fodder and to the production of sufficient fodder on the farm.

GERMANY (*continued*)

Publisher	Producer	Length in metres		Synchronized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
Reichsnährstand	Herbert Kebelmann	1057	419		+	12-12-1938
»	KIFO Hellmut Bousset	3009	1316		+	28- 1-1939
»	Commerz-Film AG.	1905	760		+	15- 2-1939
Reichsverband der dtsch. Pflanzenzuchtebetriebe (*German Association of plant selection enterprises*)	Korporationfilm Schmücker & Co.	1507	602		+	27- 1-1939
Reichsfinanzministerium (*Ministry of Finance*)	Commerz-Film AG.	466		+		21-11-1938
Arnold & Richter, Munich	Arnold & Richter, Munich	421		+		29- 9-1936
I. G. Farben AG., Ludwigshafen	Terra-Film GmbH	800	319		+	9-12-1935 4-12-1936
I. G. Farben AG.	I. G. Farben AG.	1502	531		+	23-11-1935 12-11-1936
»	»	1528	533		+	14- 2-1934 13-11-1936
»	»	1898	762		+	8- 1-1935 12-11-1936
»	Svend Noldan	397	158		+	5- 2-1934 7-12-1936
»	I. G. Farben AG.	465	185		+	2- 3-1937
»	Svend Noldan	1126	447		+	30-12-1936 15- 1-1937
Dtsch. Kalisyndikat	Dtsch. Kalisyndikt	1584	682		+	9- 3-1933 10- 1-1936

GERMANY (*continued*)

FILM TITLE	SUMMARY
Fortschrittliche Weidenutzung (*Advanced exploitation of pasturage*).	Showing modern technical methods on grazing land.
Aus dem deutschen Gemüsebau (*Vegetable-growing in Germany*)	Instructions concerning advanced methods of vegetable growing.
Der Getreidebau (*Cereal growing*).	Soil preparation. Value of good seed. Care of young crops. Manure.
Unkrautbekämpfung durch Hederich-Kainit (*Kainite as a weed-killer*).	Destructive action of kainite on weeds.
Ernte - eine Geschichte aus der Schwalm (*Harvest*).	Dramatized instructive film.
Der Tüchtige schafft's (*What a good farmer can do*).	A small farm which has been neglected is transformed into a model farm by the work of a capable farmer.
Schlaraffenland (*Land of plenty*)	Comic film.
Kolko - die Geschichte eines Rübenprotestes (*Kolko - the history of a beet's protest*).	Comic film.
Die Kartoffelrivalen (*The potato and its rivals*).	Comic film.
Die mageren und die fetten Kühe (*The lean and the fat kine*).	Comic film.
Die verregnete Kirmes (*The fair on a rainy day*).	Comic film.
Leistungskraft der Scholle- Lebenskraft des Volkes (*The productive capacity of the soil is the vital strength of the people*).	The world war has demonstrated that the pre-war food policy was wrong. The dietary freedom of the people must be guaranteed by means of an increased and rational cultivation of oil-yielding plants and by fattening pigs with farm fodders.
Von Schätzen die im Boden liegen (*Treasures hidden in the soil*).	Coal-mining, ores, production of Thomas slag.
Das Wunder der Pflanze (*The miracle of the plant*).	Details of the growth of plants until the formation of the fruit. Importance of ambiental factors.
Mit 60 PS ins Glück (*A 60 HP trip to happiness*) .	Travels of a young farmer who learns to understand the progress made in agriculture and technical methods.
Wie die Saat so die Ernte (*As the seed, so the harvest*).	German undertaking handling plant selection. Cereal growing. Manuring in relation to crop rotation.
Aus der Gewinnung von Kokereistickstoff (*Recuperation of nitrate from coke*).	Extraction of nitrate from coal.

GERMANY (*continued*)

Publisher	Producer	Length in metres		Synchronized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
Dtsch. Kalisyndikat	Dtsch. Kalisyndikat	429	167		+	16- 3-1933 16- 5-1936
»	»	1342	504		+	31- 1-1935 6- 1-1936
»	»	561	222		+	15-11-1935 4- 3-1936
»	»	355	159		+	15-11-1936 17- 1-1936
»	Commerz-Film AG.	1134	449		+	12- 8-1935 17- 1-1936
»	UFA	1050	390		+	10-10-1935 10- 1-1936
»	Svend Noldan	322			+	23- 8-1935
»	»	298	114		+	9-10-1935 17- 1-1936
»	»	148	58		+	23- 8-1935 17- 1-1936
»	Commerz-Film AG.	180	69		+	12- 8-1935 12- 1-1936
»	Svend Noldan	261	101		+	9-10-1935 14- 1-1936
»	Dtsch. Kalisyndikat	1195	480			5- 1-1939
Verein der Thomasmehlerzeuger	Verein der Thomasmehlerzeuger	1079	457		+	2- 3-1936
»	»	1118	443		+	2- 3-1936
»	»	1797	734		+	10- 3-1936
Dtsch. Superphosphat Industrie (*German superphosphate industry*)	Stocker AG.	942	375		+	15-11-1935
Dtsch. Ammoniak Verkaufsvereinigung	UFA	271	111		+	3- 3-1936

GERMANY (*continued*)

FILM TITLE	SUMMARY
Kalk tut not (*Lime is necessary*).	Existence and disappearance of lime in nature. Impoverishment of lime. Analysis of soil.
Arbeit brich Not. Arbeit schafft Brot. (*Work eliminates poverty. Work procures bread*).	Conquest of new land for crops by the Labour Service.
Mähen ist schwer (*Mowing is hard work*).	Bad harvests due to an unnoticed need for lime show the necessity of a thorough vocational training.
Ohne Kalk kein Leben (*There is no life without lime*).	In spite of careful labour on the land the yield decreases due to soil acidity and lack of lime; the result is many weeds and diseased cattle.
Unkräuter als Leitpflanzen (*How weeds act as signals*).	Weeds obtain nourishment from elements contained in the soil and steal light and air from useful plants.
Lebendes Land (*The living earth*).	Origin and composition of the soil. Principles of plant nutrition and manuring. Soil tillage. Importance of seed.
Der Pflanzendoktor (*The plant doctor*).	The rational use of cyanamide not only fertilizes the soil but attacks the enemies of plants and cures their diseases.
Aus Stein und Luft wird Brot (*Bread from stones and air*).	How cyanamide is produced.
Untersuchungen ber Mineralmangelstoff im Pflanzenwachstum (*Research concerning the lack of mineral elements in the growth of plants*).	The importance of rare elements in the growth of plants.
Chilesalpeter im Austauschgegen deutsche Warene (*Nitrates from Chile in exchange for German goods*).	Arrival. Storage and trade in Chilean nitrate at Hamburg. Loading cargoes of German goods for Chile.
Weit ist der Weg vom Rübenacker zur Zuckerfabrik (*It's long way from the beet field to the sugar factory*).	Importance of tilling the soil for the sugar beet crop. Manuring. Rational care.
Zuckerrübenbau in Klein-Wanzlebeb (*Cultivation of the sugarbeet at Klein Wanzleben*).	Development of the undertaking. Sugar factory. Social agricultural equipment.
Vom Bauernhof zum Grossbetrieb (*From the small holding to the large undertaking*).	Seed disinfection guarantees the harvest.
Frucht in Gefahr (*Crops in danger*).	Creation of meadows. Selection of good seed. Different methods of cultivation. Practical consequences.

GERMANY (*continued*)

Publisher	Producer	Length in metres 35 mm. wide	Length in metres 16 mm. wide	Synchronized sound or talking	Silent	Date of release
Dtsch. Ammoniak Verkaufsvereinigung	UFA	943	389		+	29- 2-1936
»	Kinomatografische Vereinig. d. Krupp AG.		368		+	24- 3-1936
Kalkdienst	Svend Noldan	908	359		+	24- 3-1936
Verein deutscher Kalkwerke (*Federation of German Lime Kilns*)	Verein deutsher Kalkwerke	397	141		+	5- 9-1935 3- 1-1936
»	»	338			+	5- 9-1935
Bayr. Stickstoffwerke AG.	Peter Gscheidl		504 689	+	 +	20- 3-1936 29-10-1936
»	UFA	1280	501		+	23- 1-1936 27- 3-1936
»	»	609	240		+	16- 9-1935 27- 7-1936
Chilesalpeter GmbH	Landw. Versuchsstation New Jersey u. Univers. Rutgers (*New Jersey and Rutgers University Agricultural Research Station*)		368		+	17- 2-1938
Jan Borgstädt, Hamburg	Jan Borgstädt, Hambourg		158		+	16- 7-1936
Chilesalpeter GmbH	Chilesalpeter GmbH		411		+	3-12-1938
Rabbethge & Giesecke AG., Klein-Wanzleben	Körösi & Bethke		308	+		- 7-1938
Wentzel-Teutschenthal	Stoecker-Film AG.	2885 2500		 +	+ 	21- 7-1936
I. G. Farber AG. « Bayer », Leverkusen	I. G. Farben Ag.	821	328		+	29- 1-1938

GERMANY (*continued*)

FILM TITLE	SUMMARY
Vom Grünland (*Grazing*).	Creation of meadows. Selection of good seed. Different methods of cultivation. Practical consequences.
Der Schatz im Acker (*Treasures in the field*)	Flax growing.
B. — ANIMAL HUSBANDRY.	
Verbesserung der bäuerlichen Hühnerhaltung (*Improved poultry rearing among peasants*).	The breeding and care of poultry. Rational construction of hen runs.
Das Schweineglück – Die Schweinezucht (*Pig-breeding*).	Pigs for breeding purposes. Rearing of porkets. Rational feeding.
Das Schweineglück – Die Schweinemast (*Pig fattening*).	Rational feeding and control of output.
Pflege von Hufen und Klauen (*The care of hoofs and cloven hoofs*).	Diseases of hoofs and cloven hoofs. Care and shoeing.
Das deusche Warmblut als Bauern und Soldatenpferd (5 Teile) (*German thoroughbred horses for the farm and the army*). (*5 parts*).	(1) Historical. (2) East Prussia. (3) Hanover. (4) Holstein. (5) Oldenburg and East Friesland.
Von Schafen und Wolle (*Sheep and wool*).	Encouragement of sheep-rearing. The wool market freed from foreign competition. Breeding and care. Animals valuable for production of wool and meat. Shearing according to modern technical methods; cleaning of the wool. Products.
Neuere Bekämpfung der Schafräude (*New methods for control of sheep mange*).	Control methods.
Schafzucht und Schafhaltung (II Teile) (*The breeding and care of sheep. 11 parts*).	Feeding and equipment of sheepfolds. How to commence sheep-rearing. Fixed and migratory sheep-farming. Training of shepherds. Peasant sheep-farms. The wool clip and its sale.
Der kluge Mann baut vor (*The intelligent man takes precautions*).	Methods to be adopted against swine fever. Importance of pig-breeding.
Entstehung und Bekämpfung der Leberegelseuche (*The origin of the fluke-worn and means of control*).	The fluke worm and the way to combat the disease.
Der gelbe Galt (*Mastitis*).	A dangerous disease of the udder of the milch-cow. The film may only be shown to veterinary surgeons, their assistants and in schools for milkers.

GERMANY (*continued*)

Publisher	Producer	Length in metres: 35 mm. wide	Length in metres: 16 mm. wide	Synchronized sound or talking	Silent	Date of release
I. G. Farben AG. « Bayer », Leverkusen	Korporationsfilm Schmücker & Co.	675		+		
»	»	378		+		
Reichsnährstand	Landesbauernschaft Thüringen		418		+	20- 5-1937
»	KIFO-Hellmut Bousset		493		+	24- 4-1936
»	»		140		+	24- 4-1936
»	Ing. Filzinger, Klotzsche b/ Dresden		262		+	April 1937 31- 8-1938 New edition
»	Körösi & Bethke	400	170		+	
		852	343		+	16- 2-1939
		919	371		+	13- 2-1939
		812	333		+	13- 2-1939
		1194	488		+	20- 3-1939
Reichsverband der dtsch. Schafzüchter (*Federation of German sheep farmers*)	Deutsche Fox AG.	535		+		13-12-1938
			213		+	14-10-1936
»	Notdurft		120		+	1- 2-1939
»	Herbert Kebelmann	3992	1595		+	14- 1-1939
I. G. Farben AG., Frankfurt /M.	I. G. Farben AG.	692	240	+		
			240		+	2- 2-1937
»	»	452			+	8-12-1938
»	»	365			+	

GERMANY (*continued*)

FILM TITLE	SUMMARY
Der Hühnerhof (*The poultry farm*).	The rearing and shipment of chickens on a poultry farm.
Entwicklungskreis des grossen Leberegels (*Growth cycle of the large fluke-worm*).	The life of the fluke-worm.
Vom Bienenstaat (*The world of bees*).	Life in the bee world. The importance of the bee in agriculture.
C. — VARIOUS: FORESTRY, HORTICULTURE, VITICULTURE	
Pflege landwirtschaftlicher Maschinen (*Care and maintenance of agricultural machinery*).	Rational care and maintenance in good condition. Threshing equipment. Binders. Seed drills. Agricultural implements.
Deutscher Tabakbau (*Tobacco growing in Germany*).	Origin of the habit of smoking tobacco. Tobacco growing in Germany. Tillage. Sowing. Care. Disease and pest control. Harvesting the crop. Processing tobacco.
Deutsches Obst (*German fruit*).	Review of fruit-growing in Germany. General instructions concerning advanced methods of fruit-growing in Germany. Improvement. New plantations. Care and manuring.
Einheimische Heil- und Gewürzpflanzen (*Indigenous medicinal and seasoning plants*).	Collection of simples. Principal medicinal and seasoning plants. Rational gathering and drying.
Richtige Pflege und Erweiterung des landwirtschaftlichen Obstbaus (*Fruit-growing: its extension and rational technique*).	Starting new plantations. Upkeep and care of stands.
Der Borkenkäfer und seine Bekämpfung ((*The bark-beetle and methods for its control*).	Presence of the bark-beetle. Illustration of damage. Preventive measures.
Der Obstbau in der Erzeugungsschlacht (*Fruit-growing in the production campaign*).	How to obtain maximum yields of selected quality.
Vom deutschen Wein (*German wine*).	Work in the vineyards, from the first breaking up of the soil to tasting the wine.
Pflanzenschutz tut not (*Plant protection is indispensable*).	Animal and plant enemies in fruit-growing; how to combat them.
Zünftiger Gemüsebau (*Vegetable-growing on rational lines*).	Important measures leading to higher and better yields. Controlled sales through market organization.
Bilder aus dem deutschen Weinbau (*Pictures of German viticulture*).	German wine-growing regions. Campaign against the pests of the wine-crop.

GERMANY (*continued*)

Publisher	Producer	Length in metres: 35 mm. wide	16 mm. wide	Synchronized sound or talking	Silent	Date of release
Arnold & Richter, München	Arnold & Richter, Munich		180	+		
Fritz Rühr, Neukölln	Fritz Rühr		101		+	10- 1-1939
Paramount Film AG.	Paramount-Film AG.	362				30-12-1938
Reichsnährstand	Tiller-Film	586	236		+	27-11-1936
Dtsch. Kalisyndikat	Dtsch. Kalisyndikat	1109	443		+	4- 3-1936
»	»	1341 984	593 392	+	+	23-12-1936
Reichsnährstand	Körösi & Bethke	1042	422		+	21-10-1937
»	Fritz Puchstein	1200	454		+	25-10-1937
»	Commerz-Film AG.	222	96		+	17- 7-1937
I. G. Farben AG., Ludwigshafen	I. G. Farben AG.	1120	489		+	17- 7-1935
»	»	1173	485		+	22- 8-1935 6- 1-1936
« Bayer », Leverkusen	»		419		+	2- 3-1937
I. G. Farben AG., Ludwigshafen	»	1174	475		+	8- 2-1938
I. G. Farben AG.	»		353		+	17- 9-1938

GERMANY (*continued*)

FILM TITLE	SUMMARY
Frühling im Alten Land (*Spring in 'the old country'*).	The 'old country', near Hamburg is the most important fruit-growing region in Germany. The lime shortage is harmful to the crop. Gathering and marketing cherries.
Schädlingsbekämpfung im Weinbau (*The anti-parasite campaign in wine-growing*).	Manufacture of 'Cuprasol' in the Hamburg-Wilhelmshaven factory. Spraying the vines. Attacking vine-moths and peronospora.
Mehr Pflanzenschutz (*Better plant protection*).	Anti-parasitic and anti-cryptogamic measures in the cultivation of fruit, vegetables, vines, hops and tobacco.
Wunder der Scholle (*The miracle of the soil*).	Plant selection on the farm belonging to Messrs. Dippe Bros. AG.
Ernte frisch auf dem Tisch (*Fresh vegetables for the table*).	How small gardeners and settlers can produce fresh vegetables for their own use.
Vom Hochmoor zum Humusdünger (*From the peat moor to humus fertilizer*).	Transformation of peat into a complete humus fertilizer called 'Huminal'.
Humus und düngung (*Humus and manure*).	Uses of 'Hakaphos', a complete garden fertilizer.
Heimat der Zuckerrübenzüchtung (*The home of sugar-beet selection*).	Description of the firm's beet selection organization.
Kleinkrieg (*Guerilla warfare*).	The use of gases in the control of parasites and vermin (larvae of the Mediterranean flour moth)
Spuk ((*Magic*).	A comic story describing the action of basic slag in a small garden.
II. — SOCIAL EDUCATION	
Arbeit im deutchen Walde (*Work in German forests*)	Establishment of stands. Sowing by hand and by machinery. Felling of trees and preparation of the timber. Assembling the instruments. Timber storage and transport.
Von der Rebe bis zum Glase: 6 Teile (*From vine to glass. 6 parts*).	Work in the vineyard in winter, summer and autumn. Grafting. Disease and pest control. The wine harvest. Pressing the grapes. Drawing off the wine. Wine and champagne.
Das Schweineglück. Die Fachschule (*The vocational school for pig-rearing*).	Description of training given to future pig-breeders in the special vocational schools.
Gewinnung gûter Milch (*How to produce good milk*)	Material. Milking. Cleaning the byres. Feeding the milch cow. Training the milker.

GERMANY (*continued*)

Publisher	Producer	Length in metres		Synchronized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
Verein dtsch. Kalkwerke	Verein dtsch. Kalkwerke	689			+	6-11-1935
Pflanzenschutz GmbH, Hamburg	Kosmas-Film, Jan Borgstädt	166	65		+	14- 8-1937
Gebr. Borchers AF., Goslar a. Harz	Gebr. Borchers AG.		304		+	9- 3-1939
Gebr. Dippe AG., Quedlinburg	Gebr. Dippe A. G.	1654		+		5- 8-1938
Franz Haniel & Cie, Mannheim	Josef Starek, Mannheim		121		+	7-.8-1936
»	»		190		+	24- 3-1938
»	»		219		+	28-12-1938
Rabbethge & Giesecke Klein-Wanzleben	Körösi & Bethke		308	+		7- 7-1938
Degesch Dtsch. Ges. f. Schädlingsbekämpfung	Epoche - Gasparcolor	397		+		5- 2-1938
Verein der Thomasmehlerzeuger	Verein der Thomasmehlerzeuger	501	205		+	10- 3-1936
Reichsnährstand	KIFO-Hellmut Bousset		891		+	March 1936
»	»		1500		+	March 1936
»	»		300		+	24- 4-1936
»	»	1356	563		+	6- 7-1936

GERMANY (*continued*)

FILM TITLE	SUMMARY
Die Erzeugungsschlacht geht weiter (*On with the production campaign*).	Farm inspection. Milk recording. Stable buildings. Parcelling out of grassland. Treatment of seeds.
Die Landfrau in der Erzeugungsschlacht (*The farmer's wife and the production campaign*).	Gardening. Care of poultry. Processing milk. Rearing young cattle. Food preservation.
Jugend im Zeichen der Leistung (*Youth under the banner of work*).	Pictures of the vocational competitions in the Reich.
Bauernhände schaffen die Hitlerspende (*Hitler's ideas become reality through peasant labour*).	Collective cultivation of flax.
Tante Inges Garten (*Aunt Inge's garden*).	Starting children's gardens.
Heim und Heimat des deutschen Landarbeiters (*The German land-worker's home and country*).	Models for the construction of farm workers's dwellings.
Arbeitserleichterung in der Hauswirtschaft (*Help for the housewife in the home*).	Labour-saving measures for the farmhouse.
Pflüg mit Kamerad (*Plough with us comrade*).	Training for agricultural work
Sachgemässe Lagerung von Getreide (*Rational cereal storage*).	Physical principles governing the rational storage of cereals.
III. — GENERAL TRAINING (TEACHING THE CONSUMER)	
Blut und Boden (Teil I) (*Blood and soil. Part I*).	The basic ideas of national-socialist policy in connection with agriculture and the initial stages of their realization.
Die Saat geht auf (Blut u. Boden II. Teil) (*The seed sprouts* (*Blood and soil, Part. II*).	»
Deutsches Bauernschicksal (*The lot of the German peasant*).	Summary of the two parts in a single film.
Altgermanische Bauernkultur (*Peasant civilization of the old Germans*).	Evidences of the Germanic civilization during the the prehistoric period and at the beginning of the historic period.
Die Stadt der Verheissung (*The city of promise*).	The peasant's imperial day, Goslar, 1934.
Reichsbauerntag Goslar (*The peasant's imperial day, Goslar,* 1935).	—
Landvolk in Not (*Countryfolk in need*).	Speech by the Chief of the German peasants concerning the national-socialist agricultural policy.

GERMANY (*continued*)

Publisher	Producer	Length in metres		Synchronized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
Reichsnährstand	Commerz-Film AG.	807	322	+		16- 1-1936
»	Tiller-Film	545	215		+	3-11-1936
»	Reichsnährstand	499	218		+	23-11-1936
»	Landesbauernschaft Schlesien		389		+	27- 5-1937
Reichsnährstand u. R. P. L.	Reichspropagandaleitung	545	217	+		25- 8-1937
Reichsnährstand	Weid. Münich	597	244		+	23-10-1937
»	Tiller-Film	570	229		+	29-12-1937
»	Tobis-Melofilm	577	223	+		21-12-1937
»	Commerz-Film AG.	686	270		+	3-11-1937
»	Reichsnährstand	885	329	+		20-11-1933 28- 1-1936
			304		+	28- 1-1936
»	Euphono-Film	1333	536	+		26- 1-1935 20-11-1936
»	Reichsnährstand	1980	797	+		9-10-1937
»	»	500		+		9- 4-1934
			193	+		15- 1-1937
»	Stoecker-Film AG.	420		+		16- 1-1935
»	Reichsnährstand	697		+		25- 6-1936
			276	+		
»	»	155	63	+		20- 3-1936

GERMANY (*continued*)

FILM TITLE	SUMMARY
Göring-Rede (*Göring's speech*).	Portions of the speech of the special mandatory for the four-year plan on the occasion of Peasants' Day, Goslar, 1936.
Das Erbe (*Heritage*).	Natural selection and training as the fundamental principles of the law for preventing diseased posterity.
Kampf um Brot (*The bread campaign*).	Conquest of new land in order to increase freedom as regards food in the Third Reich.
Unser Brot (*Our bread*).	Bread, the people's essential food.
Das Karnickel (*The rabbit*).	The market organization explained to the people.
Die Milch und ihre Verwertung (*Milk and its full utilization*).	Milking, delivery, bottling, decree concerning the milk market, butter, preserved milk.
Quellendes Leben (*The springs of life*).	General view of the German dairying regions.
Deutsche Gaue – deutsches Milchvieh (*German provinces – German milchcows*).	German breeds of milch cows in their own environment.
Luftveränderung (*Change of air*).	Use of city labour for work in the fields.
Klingende Gläser (ein Lied vom deutschen Wein) (*Tinkling glasses. A poem on German wine*).	Pictures of German wine-growing regions. Consumption and export.
Sonnenschein—Wettersclag (*Sunshine—Thunderbolt*).	Usual itinerary of hailstorms. Their secret. How to recognize them and lessons to be learned from the agricultural standpoint.
Die Reu' ist lang (*The punishment lasts long*).	Prevention of accidents on farms.
Pferde werden Soldaten (*Horses will become soldiers*).	Purchasing remounts. Preparation for military service.
Elmira, die Schmugglerbraut oder das Milliardengrab (*Elmira, the smuggler's sweetheart or the grave of milliards*).	Do not waste any food products.
Kampf den Schädlingen (*The campaign against pests*).	Animal pests of food products and methods of control.
Sonne über Deutschland (*Sunshine over Germany*).	Rational building methods for the protection of food from the effects of sunlight.

GERMANY (*continued*)

Publisher	Producer	Length in metres: 35 mm. wide	Length in metres: 16 mm. wide	Synchronized sound or talking	Silent	Date of release
Reichsnährstand	Reichsnährstand	262	107	+		
»	Tiller-Film	330				28-10-1935
			134	+		17-12-1937
			110			17-12-1937
»	UFA	330		+		24- 2-1936
			133	+		15- 9-1936
»	UFA	335		+		
»	Döring-Filmwerke	480		+		6- 2-1937
			192	+		28- 4-1938
»	Paramount	510		+		-10-1935
			202	+		9- 1-1936
			249		+	8- 1-1936
REM	Tobis-Melofilm	485		+		10- 7-1937
Reichsnährstand	Commerz-Film AG.		213	+		15- 1-1938
»	Tobis-Melofilm	536		+		2- 2-1937
»	Lex-Film	603	243	+		15-12-1937
Ceres - Hagelversicherung (*Ceres Hail Insurance Company*)	Stoecker-Film AG.		205	+		27- 1-1937
		692			+	28- 1-1937
			280		+	28- 1-1937
Landw. Berufsgenossenschaft (*Vocational Company for agriculture*)	»	—	210	+		22- 9-1936
Körösi & Bethke	Körösi & Bethke		145	+		28-10-1936
			168		+	28-10-1936
Reichsnährstand	Tolirag	452		+		20- 3-1937
			186	+		31- 5-1937
»	Kebelmann	590	236		+	9- 3-1937
»	Kürlies	626	270		+	20- 3-1937

GERMANY (*continued*)

FILM TITLE	SUMMARY
Schutz der Lebensmittel vor Witterungseveinflüssen (*Protection of food products against climatic influences*).	Measures for the protection of food products against heat, frost, damp, dust.
Der Wundergarten (*The garden of marvels*).	Duties in connection with truck gardening.
Schreck bei Niedermeier (*Terror at Niedermeier's*).	Importance of saving.
Das Rezept (*The recipe*).	A mixed diet is good for man.
2. Reichsnährstands-Ausstellung Hamburg 1935 (*2nd Agricultural Exhibition at Hamburg, 1935*).	Film reports on the exhibition.
Reichsnährstands-Ausstellung Frankfurt a. M. (*Agricultural Exhibition, Frankfurt a/M., 1936*).	Report on the exhibition and its outstanding features.
Auf geht's (*Let's go!*).	Report on the agricultural exhibition, Munich, 1937.
Ist heute Freitag (*Is today Friday?*)	Film about deep sea fishing and the sale of fish.
Devisen im Netz (*Net fishing*).	Film about herring fishing.
Das rätselvolle Haus (*The house of mystery*).	Increase in the consumption of potatoes in the household. Potato recipes.
Perlende Wasser, prickelnde Getränke (*Aerated waters, sparkling drinks*).	Natural and artificial mineral waters. Manufacture of fruit extracts. Manufacture of lemonades.
Vom Moor zur Ernte (*From swamp to harvest*)	Breaking up of swamps by the isolated worker. An electric station burns peat, produces current and runs a huge greenhouse.
Verwandelte Früchte (*A metamorphosis in fruits*)	Showing fruit from the blossom period to the time of picking and its use in the production of fruit wines.
Samen und Seile (*Seeds and ropes*).	Cultivation, harvesting and use of hemp.
Glitzernde Fäden (*Glittering threads*).	Biological development of the silkworm. Living conditions. Use.
Alle machen mit (*Everyone works together*).	Propaganda for the creation of swimming pools in the country.
Wasser her! (*Bring along the water*).	Water supplies in the home and stable.

GERMANY (*continued*)

Publisher	Producer	Length in metres: 35 mm. wide	Length in metres: 16 mm. wide	Synchronized sound or talking	Silent	Date of release
Reichsnährstand	Tolirag	600	246		+	5- 8-1937
»	Tiller-Film	391		+		10-12-1936
»	»	328		+		7- 5-1936
			131	+		11-11-1936
»	»	492		+		24- 8-1937
»	UFA		385		+	16-11-1935
R. N. St.	»	601	241	+		15- 2-1937
			238		+	1- 4-1937
»	Reichsnährstand	594	278		+	16-12-1937
		672	270	+		20-11-1937
Reichsfischwerbung GmbH	Infra-Film	586	231	+		28- 3-1938
			293			12- 5-1938
					+	9- 4-1938
»	UFA	579	234		+	19- 4-1938
Reichsnährstand	Commerz-Film AG.	361	140	+		7- 2-1938
Kebelmann	Herbert Kebelmann	367		+		
		595			+	13- 5-1936
			120	+		
			237		+	22- 5-1936
»	»	382		+		4- 9-1935
			176		+	7- 2-1938
			153	+		7- 2-1938
»	»			+		5- 1-1938
Reichsnährstand	KIFO-Hellmut Bousset	410	164	+		17-10-1938
»	Fritz Kammerer, Leipzig	330	132	+		7- 2-1939
		469	186		+	
»	UFA	420	169	+		13-12-1938
						3- 2-1939
»	Tiller-Film	539	216	+	+	18- 1-1939

GERMANY (*concluded*)

FILM TITLE	SUMMARY
Eine grosse Familie (*A large family*).	The many uses of the potato as a raw material.
Die Kartoffel als Rohstoff (*Potatoes as raw material*).	Manufacture of potato starch and flour.
Das gute Roggenbrot (*Good rye bread*).	The correct way of baking rye bread with a mixture of potato starch.
Kinder der Kartoffel (*Derivatives of the potato*).	The use of potato starch and potato tapioca in the household.
Korn und Eisen (*Wheat and iron*).	A trip through the agricultural and industrial regions of Saxony.
Kleine Gans – ganz gross (*The goose*).	Propaganda for the use of goose-meat.
Grundstoffe der Ernährung (*The basic elements of diet*).	It is healthy to eat fish.
Die Uhr ist nicht mein Herr! (*I am not a slave to time*).	Inland fishing. Old fishermen and their methods.
Wo der rote Wein wächst (*The red wine region*).	Wine-growing in the Ahr, the German red wine region.
Von der Traube zur Flasche (*From bunch to bottle*).	The vineyards on the Rhine. The wine harvest. Pressing the grapes. The wine museum at Wiesbaden.
Von der deutschen Scholle zur deutschen Hausfrau (*From German soil to German housewife*).	The Maggi Company's relations with German agriculture. How the Company's products are manufactured.

GERMANY (*concluded*)

Publisher	Producer	Length in metres 35 mm. wide	Length in metres 16 mm. wide	Synchronized sound or talking	Silent	Date of release
Reichsnährstand	Döring-Filmwerke gmbH	368	144	+	+	9- 2-1939
»	»	697	301		+	23- 2-1939
»	»	773	329		+	23- 2-1939
»	»	547	223		+	13- 3-1939
Verein zur Förderung der agrarpolitischen Aufklärungsarbeit im Gau Sachsen	Deutsche Filmherstellungs- und Verwertungs-Ges. m. b. H.	447		+		20- 1-1939
Hauptvereinigung der dt. Eierwirtschaft	Korporationfilm Schmücker & Co.	490		+		17-12-1937
Reichsfischwerbung	UFA	387	156	+		21-11-1938 14-12-1938
»	Sonne-Film Fiedler & Siebert		270 209	+	 +	 17- 1-1939
Kulturfilm-Institut GmbH	Kulturfilm-Institut GmbH	348		+		4- 1-1935
Herbert Kebelmann	Herbert Kebelmann	426		+		10- 1-1936
Maggi-GmbH	UFA	510 586		+	 +	7-12-1936 2-12-1936

MISCELLANEOUS INFORMATION

Storehouses for potatoes

In the majority of the Northern countries, storage of potatoes during the cold season is still generally effected by depositing in pits and covering over with earth, namely, according to the traditional method, necessitating each year a heavy expenditure of work and straw, without however, offering any guarantee of storage free from loss.

The inadequacy of this system of storing in pits was particularly evident during the last severe winter. The severe cold frequently prevented removing the potatoes from the pits when they were required; moreover, the opening up of the pits in spring proved a disagreeable surprise as regards the state of conservation of the potatoes, which had been left entirely untouched from the time when they had been covered over in winter.

The increased cultivation of potatoes and their growing importance as a food in war-time necessitate employing more rational methods of storage, where these valuable tubers run less risk of loss.

To this end, first of all greater attention must be given to the natural properties of the tubers and to their behaviour during storage. They constitute, in fact, a living, very aqueous product which undergoes a rest period during the cold season, then, in proportion as the warm weather begins, they revive and commence germinating.

Under natural conditions, the state of rest of the potatoes takes place at a low temperature, the optimum being between 2° and 3° C., with little access to air, in an environment not humid nor too dry, and with no infiltration of light. The tubers are particularly susceptible both to frost and to a warm humid and poorly ventilated environment. They do not support temperatures below -1° C., nor, during storage, temperatures above 8° C. In an immobile, warm and moist atmosphere, potatoes constitute an ideal nutritive medium for bacteria and fungi, which soon attack and rot them.

The problem of proper storage, therefore, consists not only in protecting the tubers against excessive cold or heat from outside, which occurs when the potatoes are buried, but also to prevent spontaneous heating and the development of moisture, which is only possible with controlled ventilation in storehouses constantly accessible.

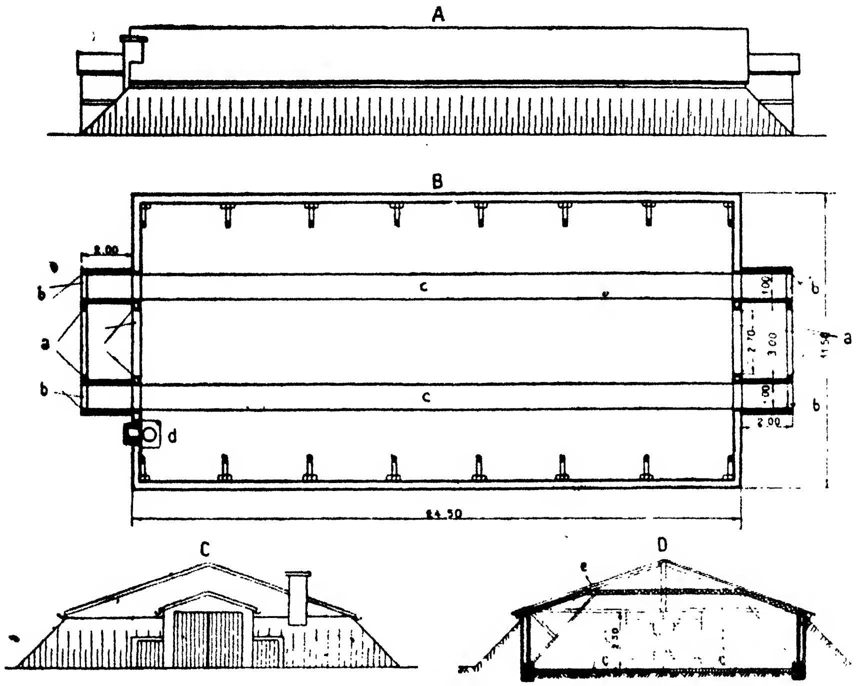
To attain their purpose, potato storehouses, therefore, should first of all have well insulated walls and ceilings as well as an appropriete ventilation device. This, however, is not enough: the labour shortage also compels a construction taking into account the possibilities of: (1) unloading the crop as rapidly as possible; (2) sorting during the winter season without involving much labour; (3) easy transport for consumption whenever desired.

To be economically advantageous, that is not to affect the price of potatoes through excessively high construction costs, the storehouses should have as large a capacity as possible per cubic metre of space constructed. This is only possible by piling the potatoes very high, which is not easy, however, to realize. These heaps necessitate particularly careful ventilation and also special devices for attenuating the pressure exercized on the potatoes in the lower layers and which would damage their texture.

Improvements in potato storehouses have resulted in two new types. The potato barn where the tubers are placed in heaps of low (1.2 m.) and average (2.2 m.) height, without the space always being fully occupied; and the storehouse with lattice containers which allow piling up of the potatoes to a height of from 2.5 to approximately 4 m. and thus fully utilize the space.

The potato barns are generally rectangular constructions built level with the ground, having a middle corridor with entrance and exit doors with two opposite narrow fronts (see Fig. 1, taken from the article of RUDOLPH entitled ' Bleiben wir bei der Kartoffelmiete? ' (' Are we to keep on with the usual potato pits? ' published in *Die Technik in der Landwirtschaft*, Berlin, 1942, Nr. 3, S. 39). Thermic insulation of the external walls is best obtained by means of an outside earthen rampart placed against them.

FIG. 1. — *Potato barn with a capacity of approximately 2600 quintals tubers*



A = Lateral view — B = Draft — C = Front view — D = Cross section.
a = Doors — *b* = Shutters — *c* = ventilation pipes — *d* = Stove — *e* = Asphalt sheet.

To obtain the earth necessary for this wall protection, the level of the ground inside the construction is lowered about 50 cm. For the construction of the enclosure walls, the use of pisé has also given good results; these walls should be 80 cm. thick and rest on stone, brick or concrete foundation walls, the footing of which should exceed by at least 40 cm. the level of the ground. Seeing that the plinth walling is not unaffected by frost, it has to be specially protected by an earthern rampart. This, however, should not come into contact with the footing and rammed earth wall, so that these may be protected against penetration of moisture. The question may be raised as to whether if, with this protection, necessary nevertheless, it would be possible to lower the base of the rammed earth wall until quite close to the ground, provided that a double moisture impermeable felting were applied to the wall itself; this would also offer the advantage of a better thermic insulation for the potatoes and a greater economy in material and time in the execution of the construction. Unfortunately we have no information on experiments made on the question.

The building should be oriented, as far as possible, according to the direction of the prevailing winds, that is generally W—E. The floor is usually made of rammed earth or clay. Its level being slightly lowered in order to prevent the penetration of water from outside, the central passage is sometimes raised, which involves, outside, going upwards slightly to the doors. An indispensable condition is that the site of the storehouse is secure from subterranean water.

Like the walls, the roof and the ceiling should be as thermal insulated as possible which, for the ceiling, is obtained by a layer of clay, and the eventual storage of straw and hay in the barn, or else by means of a peat litter if the ceiling is too low. As regards the roof, the best method is to cover it with straw or asphalt sheet, materials which keep the heat in better than tiles.

FIG. 2. — *Potato container constructed in an existing cellar*

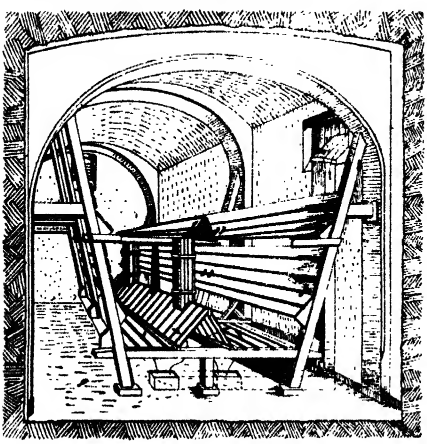
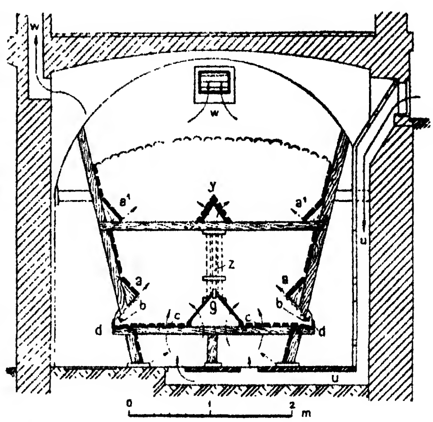


FIG. 3. — *Cross section of potato container*



a, *a*¹ = Buttresses — *b* = Openings for removing the potatoes — *c* = Floor of container, with ventilation slots — *d* = Lowerable listel — *g* = Ventilation channel — *u* = Fresh air inlet — *w* = Used air exit — *v* = Ventilation channel, serving also as buttress — *z* = Vertical ventilation shaft.

The ventilation of potato barns is effected by means of special ventilation shafts, either with the use of horizontal, triangular lattice ventilation pipes (Fig. 1, *c*), which traverse the building longwise on both sides of the central passage, and emerge at the side of the main doors, provided with special shutters. By opening the two doors of the barn and the four valves of the ventilation pipes when there is a wind, the potatoes which cover these pipes can be well aired. In the case of frost these valves will naturally be closed.

It is difficult to protect the windows and openings in the roof for discharging the potatoes into the storehouse from light, rain or frost, consequently these should be done without as far as possible. On the other hand, the installation of stoves has given good results on very cold days, as it has been found from experience that it costs less to heat the storehouse when it is particularly cold than to protect the potatoes by means of supplementary insulation devices.

In potato barns it is difficult to obtain the right proportion between space and quantity of potatoes to be stored, even if the premises are relatively low-built. In the Danish barns (see Fig. 1), with a height of 2.2 metres, the proportion is good, while with many of the earlier types of German constructions, there was room for improvement.

A full utilization of space may also be obtained by means of lattice containers in storehouses particularly adapted for this purpose, or in the existing cellars, or else in other suitable buildings.

The details of these containers, already proposed by KARCH during the preceding world war, are seen in Fig. 2 and 3, which we have taken from the article of W. STAUDINGER and entitled 'Die Massenlagerung der Kartoffeln' (Mass storage of potatoes), published in *Die Technik in der Landerwirtschaft*, Berlin, 1942, Nr. 5, S. 88.

These containers are fitted with sufficient ventilation slots and pipes, so that the potatoes are aired in a very simple manner without special apparatus. The obliquity of the side walls advantageously distributes the pressure of the mass of potatoes stored. The tubers first removed are those at the bottom, and the descending movement of the others tends to retard germination.

H. J. H.

International perpetual prize for studies on milk

Recently in Italy, and cordially recalled abroad, there has been celebrated the fiftieth scientific anniversary of Prof. Costantino GORINI, who offered the readers of this *Bulletin*, in the March number of this year, a well documentated study on the present trend of forage ensilage.

It is known that Sig. GORINI is, in particular, the Delegate of Italy at the Permanent Bureau and the Executive Research Bureau of the International Dairy Federation, as well as the President of the International Commission for the Hygienic Production of Milk. With a view to honouring, in a worthy and lasting manner, his name and his work in the field of agricultural bacteriology, the Royal Institute of Science and Literature at Milan has created the 'Gorini Foundation' for an international perpetual prize for scientists specializing in studies on milk.

Authorized adhesions and contributions have already been received by the Royal Institute at Milan.

G. T.

NEW PERIODICALS RECEIVED BY THE LIBRARY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE for the third quarter of 1942 (*).

ACADÉMIE roumaine. Bulletin de la Section scientifique. Bucureşti, v. 22 (1939/40), mens.

ARCHIVIO di oceanografia e limnologia. Comitato talassografico italiano del Consiglio nazionale delle ricerche. Roma, v. 1 (1941)–, irr. L. 40,– int.; L. 60,– étr.

BIBLIOGRAFÍA hispánica; publicada por la Sección de ordenación bibliográfica del Instituto nacional del libro español [Madrid], v. 1 (Mai-Juni 1942)–, mens. Ptas. 24.– int.; Ptas. 44,– étr. [Continues « Bibliografía general española e hispano americana »].

(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice monthly); bimestr. (every two months) déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular); mens. (monthly); n° (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

N. B. — Between brackets [/] are given translations and explanatory notes not appearing in the title of the periodical.

BULLETIN de législation comparée. Paris, Imprimerie nationale, v. 1 (1941)–, trim. (État français. Ministère de l'Économie nationale et des Finances). [Continues « Bulletin de statistique et de législation comparée »].

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Reihe 1: Koloniale Nutzhölzer, nº 1– [Nos. 1 to 15 under the title « Merkblätter über koloniale Nutzhölzer für die Praxis »];
Reihe 2: Koloniale Nebennutzungen, nº 1–
Reihe 4: Waldbau und Forsteinrichtung, nº 1–
Reihe 7: Forstpolitik, nº 1–

MITTEILUNGEN der geographischen Gesellschaft in Wien. Wien, v. 81 (1938)–, mens.

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MITTEILUNGEN des schweizerischen Fleckviehzucht-Verbandes. Bulletin de la Fédération suisse d'élevage de la race tachetee rouge. Bern, Geschäftsstelle des Verbandes, 1936–, 6 times a year at least. [Bi-lingual edition].

NORSK hagetidend; populoert tidsskrift for hagedyrkere utgitt av det Norske hageselskap. Oslo, v. 56 (1940)– bimens. Kr. 6,– p. a. [Journal of the Norwegian horticulture; popular review for horticulturists, published by the Norwegian Society of horticulture].

REVUE générale du caoutchouc. Institut français du caoutchouc. Paris, v. 19 (1942)–, 10 times a year fr. 130,– int.; fr. 170,– étr.

VERORDNUNGSBLATT des Reichskommissars für das Ostland. Riga, Deutsche Verlags– und Druckerei-Ges. im Ostland, v. 1 (30.8.1941)–, irr.

VERORDNUNGSBLATT des Reichsministers für die besetzten Ostgebiete. Berlin, Reichsverlagsamt, 1942–, irr. RM. 10,– p. a.

VERORDNUNGS- und Amtsblatt für den Reichsgau Wien. Wien, 26.8.1939–, irr. RM. 8,- p. a.

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ZEITUNGSDIENST des Reichsnährstandes. Tägliche Ausgabe A. Berlin, Reichsnährstand Verlags-Ges., v. 9 (1942)–, q. [Processed].

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Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

PRINTING OFFICE CARLO COLOMBO — ROME, SEPTEMBER 21, 1942.

MONTHLY BULLETIN

OF

AGRICULTURAL SCIENCE AND PRACTICE

HORTICULTURE AND THE WAR

The war has placed horticulture in a peculiar position.

The importance of vegetables and fruit in human nutrition has increased at the same time as the difficulties in re-victualling. Owing to import and transport difficulties, each couutry must, more so than formerly, provide for its own requirements, without the aid of foreign products imported in times of poor prodution. Lastly, production conditions have frequently become more arduous. The following brief articles review, insofar as circumstances permit, the present position of horticulture in Belgium, in the Netherlands and in Sweden.

These will be continued by similar reports on other countries for which it will be possible to obtain information.

HORTICULTURE IN BELGIUM AS AFFECTED BY THE WAR *

Belgium, which has for a long time been considered as the classical land of horticulture, owned famous plant nurseries as long ago as the XVIth century.

The interest displayed in these nurseries by the governors of the country soon gave a professional tone to production.

During the second half of the XIXth century horticulture became industrialized in the true sense of the term and specialization, carried to extremes, raised cultivation in this branch to a high degree of perfection.

The cultivation of plants, especially under glass, has given a tone all its own to the suburbs of Ghent and Bruges.

Vegetable growing has become important in the suburbs of all the large towns, but commercialized production was extensive for the most part in the environs of Mechlin, Louvain and Brussels, the principal crops being cauliflowers, asparagus, witloof chicory (Brussels chicory) and early potatoes. The last-mentioned crop was to be found in particular to the east of Mechlin.

Exports consisted mainly of these specialities and particularly of early potatoes, cauliflowers, asparagus, witloof chicory and various early crops.

Fruit growing was practised in the orchards attached to most of the farms. Production was intensified, however, to the north-east of Ghent, west of Brussels, in the neighbourhood of St Trond, Waremme, Tongres, Herve and Namur.

The celebrated grape forcing-houses established at Hoeilaart near Brussels in 1865 are world-famous.

* Communication forwarded by Mr H. VAN ORSHOVEN, Belgian Delegate on the Permanent Committee, International Institute of Agriculture.

As early as 1930, approximately, producers were suffering from the effects of a depression due to restrictions (customs tariffs, quotas, even prohibition to import) on international trade imposed by purchasing countries.

During the last years before the war, however, exports of specilized Belgian products had again reached between 500,000 and 600,000 metric quintals for vegetables and between 100,000 and 250,000 metric quintals for fruit.

Belgium is, however, a highly industrialized country, with large towns and important industrial centres requiring large quantities of horticultural products. In spite of the large home production, this situation led to the importation of considerable quantities of products, especially after the 1914-1918 war which was followed by a period during which requirements showed a large increase.

As some countries had recourse to the practice of dumping in order to place their surplus production on neighbouring markets, Belgium was compelled from 1932 to take certain defensive measures against this irregular competition.

Imports of horticultural products for the table were still increasing yearly before the war:

Fresh vegetables	250,000 to 350,000	metric quintals
Dried vegetables	500,000 to 1,000,000	» »
Fresh fruit	1,300,000 to 1,800,000	» »
Dried fruit	150,000 to 200,000	» »
Round total . . .	2,500,000 to 3,000,000	metric quintals

The interruption of transport in 1940 led, as in the case of all other agricultural products, to disorganization of the market manifested in a considerable rise in prices in those centres where supplies were poor and an extreme depreciation in the centres of production which were unable to dispose of their product. Before long, however, a rapid readjustment took place in those centres, prices following the same curve as those of basic foodstuffs. These latter were soon subjected to control and there was a tendency to replace them with vegetable crops which had not yet been subjected to restrictions. The underfed consumer tried to satisfy his hunger with any product whatsoever, believing also that he would find in fruit and vegetables a source of vitamins considered as especially valuable during a period of food shortage.

The extension of horticultural crops was one of the contributing factors which led to the institution of the Crop Plan (decreed on September 15, 1941, by the Secretary General of Agriculture and Supplies); under this Plan farmers are compelled to devote a minimum percentage of their cultivated land to the production of foodstuffs considered as indispensable, such as bread cereals and potatoes.

Price control had in the meanwhile been extended to horticultural products, the first Decree dated June 13, 1941, applying to the following crops: cauliflowers, cabbage lettuce, asparagus, rhubarb, carrots, radishes and gooseberries. This list was gradually extended and at the present moment, *i. e.*, the beginning of April, 1942, the following horticultural products are subject to price control: cabbage lettuce, carrots, leeks, white-heart, red and green cabbage, shallots, onions,

chervil, spinach, celery, lamb's lettuce, sorrel, cress, Brussels sprouts, black salsify red beets, parsnips, mushrooms, witloof chicory, apples, pears, grapes.

Certain seasonal crops have, moreover, disappeared from the list.

* * *

These restrictions, however, proved useless when the market organization was still free. As soon as the quantity of produce available is less than the country's requirement, the consumer with limited means is the least likely to be served. Restrictions should aim at guaranteeing fair distribution for everyone, at reasonable prices, the price paid to producers and intermediaries being maintained within reasonable limits. Since then a system has been introduced according to which the whole output must pass through the hands of a central organization thence through the wholesaler and retailer into the hands of the consumer, direct sale from the producer to the consumer having to be eliminated.

This control, which clashes with traditional custom, was broken down by numbers of consumers anxious to be served at any price whatever.

The situation is complicated by the difficulties inherent to control of products which for a long time have been considered as not being indispensable and whose price, extremely variable even in normal times, is influenced by factors which cannot be assessed, such as colour and taste, or which cannot be foreseen at the time when an official price is fixed in advance. A sudden change of temperature, a complication encountered in transport may cause a considerable rise in the cost price or may increase the scarcity of the product. Add to all this the countless conventional qualities which cannot be taken into account in practice by control, in spite of all the efforts made in this direction. Although for certain fruits as many as five categories have been established, each category being subdivided into four qualities, it has been impossible to maintain the standardization and encouragement of quality adopted before the war.

There is, in fact, a tendency towards the levelling of qualities, because a producer who respects the control regulations must either direct his attention to quantity rather than quality, or else consent to sell his superior products at the mass price. From this point of view, the measures adopted have undoubtedly led to a retrograde movement as regards progress.

These difficulties are less flagrant in the case of basic foodstuffs because there are only a few qualities concerning which the parties concerned easily come to an agreement. Often, as in the case of wheat and potatoes, the commodity is bought and sold at a distance from the stores and only one price is necessary.

However this may be, it has been possible to introduce market organization and price control to a certain extent in regions where production is intensive and highly concentrated on small areas, such as the crop of grapes grown in hot-houses and the witloof chicory crop.

But the producer came to the bitter conclusion that the control services were absolutely unable to put a check on abuse in the subsequent stages of distribution. Does he not work for a whole season to place products on the market which only remain a few hours in the hands of intermediaries? If the latter fails to respect the maximum price or if he uses the produce passing through his hands

for the purpose of carrying out some business manoeuvre from which other advantages in kind will accrue to him, the producer finds in this a pretext for refusing the conditions offered him. A very special situation arose in regard to the chicory crop: the foreign outlets which formerly absorbed the mass of production being now practically non-existent, maximum prices were not always reached.

The maximum prices for other products are far from having been respected.

* * *

A rather curious point which had already been observed in other periods of depression is that flowers have come into fashion again in certain circles, with the result that a rise in price has often been registered.

* * *

The large demand for horticultural products consequently justified an extension of cultivation and efforts were immediately made in this direction by the authorities, supported by the horticultural organization, Federations of Horticultural Societies and the ' League of the corner of land '.

The propaganda service increased the number of lectures given, while the associations readjusted their organization (giving advice, organizing purchases in common, etc.). The press was called in to contribute on a large scale towards this work. Special advantages as regards food supplies were promised, etc.

It is true that in a country such as Belgium where the population is extremely dense, the percentage of arable land left uncultivated is of little account, but under the critical circumstances in which the country finds itself as regards food supplies, not even the tiniest piece of land may be overlooked.

A decree has been in force since 1940, compelling owners of untilled land capable of being utilized, either to cultivate it or to yield it up to other citizens who will undertake the work.

A decree issued in March, 1941, complels owners of lawns and flower beds, with certain exceptions, to use 80 per cent. of this land for growing vegetables.

A later decision (December, 1941), compels producers of horticultural plants to use part of the area under glass and of that used for growing their plants in the open for the production of vegetables.

In March, 1942, another decree allowed tenants to break up meadows without excessive regard for the conditions contained in the lease.

Generally speaking, encouragement has been given to professional horticulture which contributes towards feeding the masses of non-producers, at the same time directing them towards the production of those plants which offer the greatest possibilities from the standpoint of food, *i. e.*, those possessing the greatest content of nutritive elements, those which are most easily preserved or transformed for use during periods of shortage.

Intensive propaganda has also been carried out simultaneously in every sphere for popularizing practical methods of preservation and transformation.

* * *

Circumstances are, however, so difficult that it is not easy for all these efforts to attain a maximum of success.

In normal times, most of the seeds used are imported. Even in 1941 difficulties were encountered for these imports, and 1942 only accentuated the trouble.

On the other hand, the numerous attempts made to extend production in the interior of the country were hampered by bad weather in 1941. At the present time good seeds are rare, especially for the crops most in demand, such as carrots, leeks and onions.

Cabbage-growing was considerably extended in 1941. Unfortunately sowings were mostly of the autumn varieties, which were all the more difficult to preserve as the winter was extremely severe. Consequently there was sometimes a large surplus, followed by a shortage...

There was a general tendency towards an extension of fruit-growing. Trees in the nurseries, if they were not sold abroad, commanded high prices, but everyone knows that years must elapse before a young plantation begins to produce.

By means of the price control policy an attempt has been made to encourage the tendency to produce the more indispensable products, while, by rationing coal for horticultural purposes, an effort has been made to impede the production of fruit and early varieties at seasons when they are more expensive and when the cost of production seems to be out of proportion to the amount of foodstuff obtained.

Provisions of this kind are justifiable when the total output is increased thereby. It is, however, a policy which is open to discussion from the standpoint of food supplies pure and simple, because it is not only advisable to increase the mass of production, but also to direct it during periods of shortage in order to facilitate bridging the gaps in the interim periods. Indeed, at these times supplies are most easily compromised; available stocks are perforce scarce and early varieties play a very important part at this time. It might even be dangerous to make them scarcer. It was for this very purpose that some groups made special efforts to launch the cultivation of new varieties little known in the country or else of slight interest in ordinary times, such as, for instance, the kohlrabi. Generally speaking, these efforts have met with but little immediate success when the crops concerned are not in common use. A period of adjustment lasting several seasons is therefore required.

HORTICULTURE IN THE NETHERLANDS AS AFFECTED BY THE WAR

Dr J. D. Ruys

Owing to the relatively small area and dense population, the Netherlands are obliged to cultivate the land as intensively as possible; horticulture has for many years, therefore, been one of the most satisfactory means of livelihood in the country. The large stretches of fertile soil, the very favourable climate, offering no extremes of heat or cold, and the country's very advantageous position among the great European nations, have contributed largely towards the development of horticulture. These advantages have, moreover, been further enhanced by the artificial regulation of the water and the construction of countless canals which, on the one hand, have led to a great improvement in the soil and, on the other, offer the possibility of cheap and easy transport.

Before the war, a considerable part of the raw material necessary for agriculture and horticulture had to be imported from abroad. When not required for home consumption, the produce obtained was exported.

During the few years prior to the depression, horticulture had made great strides, mainly as result of the development of railway and water transport with Germany, England and America and of the growing demand from abroad due to the increase in urban population (in Rhineland, for instance).

Before the depression the total value of horticultural production amounted to some 230 million florins; the total export trade in horticultural products amounted in 1928 and 1929 to 130 million florins.

In 1931, and therefore before the economic depression had seriously affected horticulture, England was the chief purchaser, representing 41 per cent. of the total value exported; Germany took 30 per cent., the United States of America 5 per cent., France 3 ½ per cent. and Belgium 3 per cent., while 50,000 persons found their chief means of livehood in horticulture. An area of over 80,000 hectares was devoted to horticultural crops, as follows:

32,000	hectares	under	vegetables
34,000	»	»	fruit
10,000	»	»	flowering bulbs
4,000	»	»	trees, shrubs and flowering plants
1,500	»	»	crops for seed

As everywhere else, horticulture in the Netherlands may be divided into vegetable and fruit crops on the one hand and ornamental crops on the other.

Vegetable growing was originally directed towards local and home consumption, as well as export to England and Germany, especially to Rhineland, which absorbed chiefly vegetables.

The oldest centre of vegetable growing is Westland, lying between the large towns of Rotterdam and The Hague, where the passage of time has gradually brought about a change from cultivation in the open to cultivation under glass. Similar centres have gradually grown up in the province of Noord Holland with a specialized centre for cabbage-growing called 'Langendijk' and another, called 'De Streek', between Hoorn and Enkhuizen; in the Limburg centre (Venlo, Roermond and environs) and in the Province of Groningen in the neighbourhood of Hoogezand and Sappemeer, in broken-up peat lands and also in numerous places which are mainly of local interest.

In Westland, cucumbers, salad, carrots and cauliflowers are grown; in the village of Naaldwijk the main crops consist of tomatoes, early potatoes and Brussels sprouts. In 1930 there were 670 hectares of hot-houses in Westland, producing grapes and peaches.

In Western Friesland one of the most fertile areas of the Province of Noord Holland, potatoes (the centre being the village of Andijk and environs), and cauliflowers are cultivated in the district known as 'De Streek' already mentioned above. The district called 'De Langendijk', to the north of Alkmaar, is famous for the cultivation of every variety of cabbage, while the environs of the village of Beverwijk, north of Haarlem, is famed for its strawberries.

Over-Betuwe, lying between the Rhine, the Waal and the Meuse, with the village of Elst as the centre of fruit-growing, has cherry, apple and pear orchards; gooseberries, strawberries and raspberries are also cultivated in the district. Part of the production is used for consumption when fresh, while part goes to the jam

factories in the country and abroad, the remainder being exported to Germany and England.

Apples, pears, plums, cherries and gooseberries are grown in the Limburg area, especially in the centre and south, while the islands in the province of South Holland (to the south of Rotterdam), produce vegetables; numerous orchards are also to be found in the Zeeland Islands. Large areas are devoted to the cultivation of asparagus in the neighbourhood of the little town of Bergen op Zoom in North Brabant.

The cultivation of flowering bulbs forms the most important part of the ornamental branch of horticulture. These crops are to be found chiefly in the coastal region behind the dunes, aong the North Sea, where the most famous centre is Haarlem and the small places called Lisse and Hillegom.

Ornamental crops are also produced in the following centres: Boskoop, which specializes in growing improved trees and shrubs, especially rhododendrons, azaleas, conifers (*Taxus*, *Chamaecyparis* and others), etc; Alsmeer, formerly famous for its cultivation of cut box which ceased after the American market was closed to this production; this centre is now devoted to the production of hot-house flowers for cutting (lilac, carnations, etc.) and house plants (cyclamen). During the last few years before the war, air transport was used with increasing frequency between the Netherlands and the large foreign towns. Many firms are to be found at Oudenbosch, Zundert and Opheusden which specialize in the cultivation of trees for avenues; fruit trees are to be found particularly in the centre, east and south of the country, with a few centres in the Limburg area. Ligneous plants are produced as a speciality at Dedemsvaart and in some other places scattered throughout the country.

The depression which began to be felt seriously for the first time in 1931 due to depreciation of several currencies, the closing of frontiers, and export restrictions such as quotas, led to a disastrous setback in horticulture. In one or two years' time, sales of the various special crops decreased by more than half. Attempts were made to stabilize the situation of horticulture again by means of numerous measures such as restriction of crops decreed by the authorities, purchase of surplus output, price control and granting of government subsidies; a certain measure of success was obtained by these means, so that during the last years before 1939 results were again being obtained which, though not comparable with those obtained during the good period, were at least supportable.

The war, however, at a single blow, wiped out practically every possibility of export and the Netherlands were restricted to exporting their products to Central Europe, Scandinavia and Switzerland.

As partial and very welcome compensation, home consumption increased, since it was no longer possible to obtain a large number of articles formerly imported, so that greater interest was displayed in home-grown horticultural products.

Although forecasts did not appear very favourable after the occupation of the Netherlands in 1940, it nevertheless seemed possible to maintain the stability of the cultivation of several important products, due to the large demand from Central Europe. During the depression a whole system of legislative measures had grown up in the Netherlands which facilitated adjustment to the new

state of affairs. As has already been said, several crops were restricted or stabilized at 100 per cent. (nurseries, for instance). Others, such as cut hot-house flowers have recently been severely restricted, in order to leave room for vegetable crops; cultivation of potatoes has been encouraged by the granting of bonuses for breaking up meadows, etc.

The measures for price control adopted immediately after the outbreak of war have been extended progressively for the most part by the fixing of maximum prices and simultaneously export prices have also been fixed.

Collectivities, such as communes, etc. and private individuals have been urged to use the lawns in parks and gardens as well as fallow land, for growing beans and other vegetables, since the Netherlands are now practically reduced to their own resources for supplies of foodstuffs.

It goes without saying that these measure are of the utmost interest to the country's food supplies, since many products, such as cereals, fats, stockfeeds, fruit, etc., formerly imported in large quantities, can no longer be brought from abroad or else can be obtained from foreign sources only in limited quantities and must therefore be integrated with home products.

Owing to the nature of the soil and the good climate, the Netherlands are in the happy position of being better able to face these conditions than any other country whatsoever. Moreover, horticulture is in the fortunate situation of being practically self-sufficient and requiring very little raw material. Only the supply of manure and chemical fertilizers offers difficulties, as the latter come almost exclusively from abroad while the output of natural manure is not nearly adequate. Just as horticulture in the Netherlands has stood up to various difficult situations in the past, so it may be hoped that it will overcome the present difficulties and once more develop in a renewed and better Europe.

HORTICULTURE IN SWEDEN

Nils Sonesson

Statistics for 1937 show that the area under horticultural production in Sweden was distributed as follows:

Horticultural crops grown in the open:				
Field crops	3,971	hectares		
Other vegetable crops	10,777	»		
Strawberries	1,155	»		
Nurseries	789	»		
			16,692	hectares
Crops grown under glass:				
Hot-houses	199	hectares		
Cold-frames	186	»		
			385	hectares
Fruit crops			18,906	»
Berries			1,986	»
Total area devoted to horticulture			37,969	hectares

A considerable intensification of horticulture was observed up till 1941; the increase in vegetable crops amounted to some 1,000 hectares.

The consumption of home-grown horticultural products during 1940 may be estimated as follows:

Vegetables: 200,000 tons; fruit: 110,000 tons; cultivated berries: 20,000 tons and wild berries: 25,000 tons.

Horticultural products form a complementary factor and are much appreciated as compared with other food products; this explains why they are cultivated on a relatively large scale and considered as important from the standpoint of supplies and food hygiene. It is even to be expected that the consumption of these may continue to increase when all restrictions have been removed and for this reason it is essential that more interest should be displayed in horticulture than formerly, considering the important part it plays in the country's supplies. There is all the more justification for this when one considers the wide possibilities offered by home-grown crops. It should not be forgotten, however, that the organization of horticulture, to a much greater extent than that of agriculture, encounters certain difficulties due to its complex character and distribution throughout numerous farms in different regions of the country. It should also be remembered that since all these products are essentially different in type and highly perishable, horticulturists cannot organize themselves as do farmers (see the constitution of economic associations, etc.), and that, on the other hand, horticultural products cannot, generally speaking, be subjected to lengthy storage, while at the same time it is fairly difficult to place them on the market.

A spontaneous increase in the area sown to vegetables has, however, been anticipated which will reach about 24,000 hectares during the current year, including chiefly French beans, peas, cabbages, spinach and tubers. The most important tubers are always, of course, potatoes, although they are considered as belonging to agricultural crops. An increase of about 250 hectares is expected in the area devoted to strawberries.

A distinction is made between horticultural crops grown for domestic use and those grown commercially on a large scale. The former have undoubtedly been the most important up to the present, while the latter have come to the fore during the last few years. It is also beyond doubt that commercial horticulture offers much better possibilities for rational cultivation and obtaining large crops of homogeneous quality better suited for preservation and distribution. Industrial cultivation is becoming increasingly predominant, parallel with the increase in standardization of products destined for sale. From the standpoint of industrial requirements in raw material, it is obvious that only rational major crops can be taken into consideration. Again, it must not be forgotten that these crops make the best use of chemical fertilizers, selected seed, etc. Lastly crops are of greater importance when not grown exclusively for domestic use.

Among the measures adopted for stimulating production, mention should be made, in the first place, of those directed towards the improvement of irrigation, because it often happens that crops fail owing to spring drought. Much more easily than agricultural crops properly so-called, horticultural crops can carry the economic burden imposed by the cost of hydraulic plants and other

expenses, the value of the product being much higher in the latter case. A loan fund has been established to help farmers to meet the cost of irrigation works.

The question of storage is very often of decisive importance when the rational organization of extensive horticultural crops is the end in view. Storage by the farmers themselves may be counted upon, but the increase in price does not always cover the expenses and risks incurred, so that when large stocks are in question, farmers are not always willing to store the crops for long periods. Severe losses are incurred every year due to imperfect conditions for the preservation of crops and only recently have storehouses been constructed in the country. In the principal centres of consumption, particularly, it is essential that easily accessible storehouses should be available for the products during the winter in order to ensure regular distribution without risk of severe loss. This is why the government fund recently established for the construction of storehouses of this description was a very timely measure.

As regards the preserved vegetables, berries and fruits, manufacture within the country has made great strides recently, contributing in this way most efficiently towards meeting the shortage resulting from the drop in imports which were formerly very large. In connection with methods of preservation, a distinction should be made between the various processes of sterilization, drying and refrigeration. The majority of white-heart cabbages, carrots, parsnips and red beets are stored in the fresh state, sterilization is adopted for French beans, peas, tomatoes, cucumbers and cauliflowers, the drying process being adopted only for spinach, parsley, fennel, white-heart and green cabbages, and potherbs.

The essential value of berries and fruit as features of diet does not lie so much in supplying calories as in fulfilling the following functions:

(*a*) supplying the human organism with special elements of diet of extreme importance, such as iron, calcium, various vitamins and carotene;

(*b*) acting as seasoning in order to improve the taste of a diet which would otherwise be too uniform;

(*c*) stimulating the peristaltic movements of the intestine through the absorption of vegetable fibres and similar matter.

Under present conditions, there is no doubt that it is extremely important that horticulture should be concentrated on products offering real food value. Legumes: broad beans, dwarf French beans and scarlet runners, as well as peas are of primary importance. Among the various crops supplying special matter, particular mention should be made of Savoy cabbage. This product is valuable not only because it contains carotene but also for its high calcium content; it has become highly important due to the fall in the production of dairy produce, such as milk and cheese, these latter having been till recently the chief sources of calcium supply in the diet.

During periods when the importation of vegetables or fruits has become so difficult, it is essential that the population should obtain their food supplies through home production during the first half-year (January-June). As a matter of fact, it has been observed that the amount of vitamin C is reduced to a minimum in the human organism during this period. This is why it is important that the growing of horticultural crops should be arranged in order to make products rich in vitamin C accessible, insofar as possible, during the winter season.

THE WHENCE AND WHITHER OF MILK SANITATION

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*The author of this article * gives a retrospective study on the development of milk bacteriology and, in particular, on the sanitation control of milk supplies to the towns.*

In North America, it was in the Boston area, or at least in the New England area, that the question was first raised as to whether it was necessary to allow enormous numbers of bacteria to develop in fresh milk supplies before they reached the consumer. The milk regulation which furnished the United States with the modern system of sanitation control dates from 1896 and was due to the initiative of the New York City Board of Health. Boston was the first city of the Americas and probably in the whole world, to fix a definite bacterial count limit for its milk supply.

The author concludes his study by showing that it is necessary to base milk sanitation control not only on bacterial count but also on its hygienic quality, and by indicating the measures taken to attain this end.

In any line of public health work it is well for us to stop occasionally and make a survey of the field to determine *how far we have come,* what we have accomplished, and what the future is likely to hold for us. Where the effort has been long continued, it requires real research and careful study if the past history is to be summarized satisfactorily.

In the University of Pennsylvania Archeological Museum there is a frieze secured by one of their expeditions to the site of old Babylon. This represents the dairy industry of the day. The milker is seated at the rear of the cow instead of at the side, a position which is that normally taken by those who milk sheep and goats. It is not recorded whether this method of milking cows was universally practised in those days. It is, however, evident that there were individuals at the time who objected to having visible sediment in their milk, for adjacent to the cow and the milker, a man is shown pouring milk through a vessel which appears to be a strainer. I doubt not that many a similar indication that people of old times liked clean milk could be found in the records.

* * *

However, we must admit that modern sanitation begins with the *real development of bacteriology* which began about 1880 when the gelatin and agar plate methods were developed. Four years previous Lord Lister had succeeded in obtaining a pure culture of *Streptococcus lactis* by the dilution technique. In the decade that followed 1880, solid plating media were generally used and before the end of the decade there was discussion over the question whether gelatin or agar was

* This article was kindly sent by the author as revised text, brought up to date, of a report on the subject which he presented at the 26th Conference of the Ontario Health Officers' Association, held at Toronto, Canada in 1940.

more satisfactory for use when determinations were made of the number of bacteria present in any given material. In recent years, Dr A. P. HITCHENS (1) has succeeded in determining for us just where Frau HESSE, the wife of Wilhelm HESSE, secured the idea that agar might make a satisfactory plating medium, and has shown us that the idea passed through Jersey City, New Jersey, in its passage from Java to Berlin.

It was this same Wilhelm HESSE, an assistant in KOCH's laboratory, who began discussion as early as 1888 (2) of the best way to estimate numbers of bacteria in any given medium by using the agar plate method. In the early days it was thought that the agar plate that developed large numbers of small, regularly distributed colonies was the one that was most likely to yield an accurate count. It was not realized until later that overcrowded plates did not develop the full number of colonies that were possible. HESSE and NIEDNER's report (3) shows that it was rather generally agreed by 1898 that agar was better adapted for quantitative determinations than gelatin and soon after HESSE and NIEDNER (4) pointed out that the counting is more accurate and less tedious where there are not more than 100 colonies per plate. They felt that the plates should be held from 2 to 3 weeks in order to allow all possible colonies to develop. These same authors recommended the inversion of petri plates after hardening before they were put into the incubator, thereby reducing the possibility of the growth of spreading colonies. Later it was shown by HILL (5) and BREED and DOTTERRER (6) that there was good reason in milk work for following our present practice of selecting plates so far as possible that develop more than 30 and less than 300 colonies per plate.

In spite of the fact that this technique developed first in Germany, it was in the Boston area, or at least in the New England area, where the question was first raised in North America whether it was necessary to allow enormous numbers of bacteria to develop in our fresh milk supplies before they reached the consumer. Our pioneer American dairy bacteriologist, Professor H. W. CONN, began writing papers (7) as early as 1890 discussing the source of the bacteria that were found in our milk supplies. He had a remarkably clear understanding of the relative importance of the various sources of the extraneous bacteria that found their way into milk supplies. Almost simultaneously, Professor SEDGWICK (8) published a report on a bacteriological examination of Boston milk supplies and emphasized the need for better dairy sanitation.

As early as 1893 Dr COIT of Montclair, New Jersey, induced Stephen FRANCISCO, a dairyman, to undertake the production of an exceptionally clean milk for baby feeding produced under the supervision of medical men. This proved to be the beginning of *certified milk*. It is claimed that Montclair was the first city in America and probably in the world to undertake a regular bacteriological examination of its milk supply. Professor H. L. RUSSELL (9) began his studies at Madison, Wisconsin, at about this time also. Dr W. H. PARK discussed the high bacterial count found in the New York City milk supply with suggestions regarding the sources of the bacteria as early as 1901 (10), and soon after Professor F. C. HARRISON and others began agitating the question of pure milk supplies in the Montreal area.

* * *

The *milk regulation* that really gave us the foundation of our modern approach to sanitation control of our milk supplies came from the New York City Board of Health. They introduced an ordinance in 1896 prohibiting the sale of milk in that city except under permit which was granted subject to rules and regulations of the Board. This method of control raised a storm of protest from dairymen, a natural reaction from an industry that had not previously been controlled. The regulations were challenged in the courts and the fight was even carried to the United States Supreme Court which rendered a decision ten years later supporting this fundamental regulation. From that time until this, the right of official constituted Boards of Health to control the sanitary quality of municipal milk supplies through a licence system has never been successfully opposed. It is interesting to note that even in a recent legal decision where a business concern tried to secure an injunction in a Federal Court to prevent a Board of Health from enforcing a regulation of the Board claimed by the Board to be reasonable with claim supported by evidence, the decision was, that under these conditions the Board had a right to exercise its legislative prerogatives without restraint from the Court.

Another matter of interest is the fact that Boston was the first city of the Americas, and probably in the world, to fix a definite bacterial count limit for its milk supply (1905). Some may feel that the sky was the limit for the figure chosen for market milk as delivered was 500,000 per cc. !

* * *

About 1900, responsible public health workers, organized in the Laboratory Section of the American Public Health Association, appointed a committee to standardize *methods of making bacteriological examinations of water supplies.* The Committeee appointed did such an excellent job of formulating directions for carrying out the agar plate method and methods for detecting coliform organisms in water supplies in the first Standard Methods of Water Analysis Report issued in 1905 (11) that this report became a methods manual for bacteriological research for the following decade. It was not until 1915 that the Society of American Bacteriologists organized a separate committee for the development of methods for studying pure cultures of bacteria under the chairmanship of Dr H. J. CONN, son of Professor H. W. CONN. Following this, the American Public Health Association reports became more what they were intended to be, reports outlining control procedures useful in routine work.

When the water report was first issued, it stirred up much interest because of its excellence for the period in which it was issued and a demand arose for a similar report to outline *methods for the bacteriological examination of milk supplies.* The Committee that undertook this carried out many studies in counting technique now buried in literature (12) rarely available to the modern dairy bacteriologist. Their work resulted in the presentation of the first edition of the Milk Report at Richmond, Virginia, in 1910 (13).

* * *

The Milk Committee had had much difficulty in deciding between various viewpoints regarding the *significance of bacterial counts* in milk control work and their report shows some evidence that there was compromise in the Committee as two incubation procedures were recognized. Plates were to be incubated either for 48 hours at 37° C., or for 5 days at 21° C. The infusion agar proposed was one known at the time as the most suitable for growing the largest possible number of bacteria.

At that time and practically from then until now, there have been *two schools of thought* regarding the use that should be made of bacterial counts from milk supplies. One group felt that the important thing was to detect the *total amount of bacterial life* present in the milk. This group realized that the amount of germ life in it did not indicate whether the milk was safe for use, but they felt that if the total bacterial content was considered in connection with the age and temperature of the milk, it yielded an indication of the care which had accompanied the production and handling of the milk. It was freely recognized that counts from buttermilk or sour milk much in excess of those obtained from fresh milk did not in any way indicate that these milk products were unsafe for use.

The other viewpoint was maintained by a group who felt that the total count was a matter of minor importance because in itself it did not throw definite light upon the safety of the milk as a food for human consumption. This group believed that samples of milk as delivered to the consumer should be examined by methods that would reveal whether there were *organisms present that would cause disease.* They were uninterested in the use of a medium that grew harmless types of bacteria and wanted quick results, obtained by incubation at body temperature. Their thought was that pathogens would appear on plates incubated in this way. This group held ideas that paralleled those held by many water analysts from then until the present.

While the first group had primary control in the Committee that prepared the first edition of the Milk Report, the second group came to have control in the period between 1910 and 1914. In 1914 the nature of the original report was completely changed by the introduction of a beef extract agar in place of the beef infusion agar, and the elimination of incubation for 5 days at 21°C. This fundamental change was made in a one-page report of the Milk Committee adopted at Jacksonville, Florida, in December of 1914.

During the period between 1916, when this change was incorporated in a more extensive report which has been regarded as the second edition of the Milk Report, and 1934, the type of agar adopted in 1914 has remained in use with modifications, that have, at times, quite changed the nature of the counts obtained. From 1910 to 1939 the report of the Committee on Standard Methods of Milk Analysis has been published in seven editions, each modifying the composition of the agar employed and the incubation temperature. During all of the period of these changes there was a continuous demand for an agar that would both grow the pathogens that are most commonly found in milk, and yield a total count that gave a more complete picture of the total bacterial flora present.

Meanwhile, in European countries, the thought that counts from milk supplies should really represent the total flora present dominated the picture in practically all of the countries that developed an interest in milk sanitation. This was particularly demonstrated by the studies and report (14) made by Professor G. S. WILSON in London for the British Ministry of Health after a visit to the United States and Canada to study methods of milk control in use in North America. Similar action was taken in Germany at approximately the same time.

* * *

During the period following the World War there was much complaint that the *nutritive qualities of the standard agar then in use were inferior.* Because it was believed to be possible to develop an agar which was more easily prepared than infusion agar that was at the same time capable of growing practically all of the bacteria in milk, including possible pathogens, studies were undertaken about 1934 using newer types of peptone with the inclusion of small amounts of sugar and even *milk*. The primary purpose of adding the latter ingredient was to stabilize one of the uncontrolled irregularities that greatly affects counts obtained with media that do not contain milk. Many analysts had noted the fact that higher counts were secured from the same samples from dilutions. This irregularity is normally caused by the presence in the agar of nutrients from the milk introduced in the inoculum.

During the years that had passed since 1914, it had become very evident that the *pathogenic organisms* that have caused the greatest amount of difficulty when present in milk supplies did not grow on the standard agar then in use. The pathogenic organisms in question are the organisms of tuberculosis, undulant fever and septic sore throat. Only a limited number of pathogenic organisms were capable of growing on a standard agar which contained Bacto-peptone and meat extract only.

Quite independently, the American Association of Medical Milk Commissions, under the leadership of Dr J. Howard Brown, undertook a similar study with similar aims. The conclusions reached were similar to those reached by referees appointed by the Laboratory Section of the American Public Health Association. Because the American Public Health Association Committee (15) found in the final comparative testing that the formula that was finally adopted was slightly better than the American Association of Medical Milk Commission's formula, the medium finally adopted by the American Public Health Association in 1939 was the one now known as the new standard milk agar.

* * *

Various things has conspired meanwhile to *make the situation more complicated. Several laboratory methods*, such as the microscopic method, *had been developed for counting bacteria* and the errors in agar plate counts were better understood; the methylene blue technique had been developed as an indirect method of estimating bacterial populations and control officials had utilized a wide variety

of applications of these various techniques in the improvement of municipal milk supplies. It was and is quite evident that various methods of improving milk quality may be used with success, *pasteurization* being recognized as the one thing that gives blanket protection against the presence of pathogenic bacteria (provided, of course, that the pasteurization is properly carried out and the pasteurized milk is protected from recontamination after pasteurization).

Hence, greater emphasis has been placed on controlled operation of pasteurization equipment and in the last few years the Kay-Graham and other phosphatose tests, have been developed by which it is possible to determine whether milk has been properly pasteurized. These changed conditions have also led to the use of coliform tests of milk supplies for determining with a fair degree of certainty whether milk has been properly pasteurized and protected from recontamination.

The *change from the type of agar* that had been used in milk supply control up until 1939 was brought about after careful study had shown the effects that would be produced by the change in the nature of the agar. In connection with these studies, it became increasingly evident that no counts could be made with any real degree of accuracy if the incubation temperature was retained at 37°C. It was found that normal milk bacteria (including the types that appear on plates at 37°C.) grow rapidly at 32°C. and that at this temperature variations in the temperature of incubation did not cause the serious discrepancies in counts produced when 37°C. incubation was used. It is evident that if both the new agar and a lowered incubation temperature were used the chief purpose of standardization, *i. e.*, ability to duplicate analytical results, could be attained reasonably well. While 37°C. incubation only is recognized in the Seventh Edition of the Milk Report, the American Public Health Association Committee having the matter in charge has already decided to recommend the making of 32°C. incubation optional in the Eighth Edition. Action approving this recommendation was taken at the Detroit meeting of the American Public Health Association in October, 1940.

* * *

What of the future? It is very difficult for anyone to prophesy in these days when things, both political and in the public health field, change so rapidly. It may interest you to know something of the thought of ome of the progressively minded younger and well-trained men. About twelve years ago adequate appropriations were made by New York State for the development of a real state-wide supervision of milk control work outside of New York City. Deputy Commissioner of Health, Paul B. Brooks, took a real and constructive interest in this work, and Mr W. D. Tiedeman was put in charge. ***Two mobile laboratories*** were put into operation and the personnel was selected under standards that really secured the selection of trained men. After eight years of experience with this group, Mr Tiedman summarized his views in regard to later trends in the laboratory control of the quality of milk supplies (16). In going from city to city to check the efficiency of the program carried out by local health officials

the workers in the mobile laboratories found that they could determine the quality of a given milk supply much more effectively by the use of *simpler laboratory procedures* than by the making of agar plate counts.

Their way of doing this has been to collect samples of bottled milk as delivered, examine the milk by the phosphatase test, make a microscopic preparation and also examine it for the presence of coliform organisms. Where phosphatase tests give indication of under-pasteurization, rechecks are then made at the pasteurizing plants. Rechecks are also made when positive coliform tests are obtained. The microscopic examination served as a general check on the total number of bacteria present, indicating as it does, the presence of psychrophilic bacteria, thermophilic bacteria or other bacteria that do not grow where the standard plating procedure is used with 37°C. incubation. If no bacteria are evident under the microscope, it is clear that the milk supply is not badly contaminated. Neither has the milk stood for any length of time at a warm temperature. Dead bacteria are just as significant in revealing this past history as living bacteria.

The tendency in New York State, as elsewhere, has been to reduce the *number of so-called grades of milk* based on agar plate counts to but a single grade. New York City accepted a proposal made by the Department of Health to recognize but one grade of milk after September 1, 1940. All the cities in upstate New York that had two grades of milk adopted the regulations recognizing but a single grade of milk, *i. e.*, the safest milk that can be provided for the community.

These developments in New York State have been discussed not because they represent the only progressive thought in milk control work but because they are the ones most familiar to me.

Without question, the milk supply of the future will be *pasteurized*, and its safety will be maintained by the use of a certain amount of laboratory examination of the milk. The exact test that will be used by public health workers may vary somewhat according to personal preferences, but it is clear that methods that yield results that enable the official to determine whether the milk has been properly pasteurized and protected against recontamination are likely to be regarded as fundamental in importance. There are many individuals who feel that there is no reason for attempting to reduce the number of bacteria in pasteurized milk supplies to a level below that where the microscopic technique loses its usefulness, so that I am not surprised at the increasing interest in the use of the microscopic method of examining pasteurized milk supplies.

* * *

Thus far we have merely discussed the question of the final safety of the milk as it reaches the consumer. The modern consumer is not satisfied merely with knowing that his food is free from disease germs. He also *wants it to be clean and sanitary*. Hence, the introduction of pasteurization has not really lessened the demand that our milk supplies be clean and sanitary before pasteurization. *Dairy inspection* has been found to be essential in this field because

no laboratory method has been developed whereby the difference between 'clean' and 'cleaned' milk can be detected. It is only through personal knowledge that dairy practices are cleanly, stables and milk houses clean, that we can assure ourselves that certain features in milk sanitation have been observed.

On the other hand, *rapid platform tests* which make it possible to examine cans of milk as delivered at milk plants before they are dumped into the weigh vat are now held in high repute in the New York City and New York State work. Milk company inspectors as well as municipal inspectors are being required to detect and reject unsatisfactory milk before it reaches the consumer. More and more emphasis has been placed on these platform tests in the last five years by Mr Pincus, Mr Abraham and their associates, who have charge of the control of the milk supply for New York City (17).

One test that can be applied on the platform by the trained worker with greater success than is generally believed is the *odour test*. New York City inspectors have been trained to detect odours that indicate that something is wrong with the quality of the milk as it is put on the platform. They likewise use strainer dippers to determine whether there is excess sediment or clotted milk in the can. Where there is any indication that the milk is unsatisfactory, it is rejected, samples being taken and given a microscopic examination on the spot. The microscopic examination provides additional information regarding the probable cause of the unsatisfactory nature of the milk. The entire record for any given sample gives the inspector a basis for judgment when he or the plant inspector makes a visit to the farm to correct unsatisfactory conditions.

At the present time, both New York City and New York State officials feel that they are carrying out a more satisfactory program for the control of the quality of the milk supplies sold in the City and State than they have ever used previously. From the standpoint of these officials there is very little use of the agar plate technique and it may be that this indicates a change that is likely to come more generally in the future.

* * *

There is good reason for insisting that raw milk *be freed from undesirable types of bacteria,* particularly *disease germs,* even though the milk is to be pasteurized. This purpose cannot be accomplished by merely keeping the number of bacteria at a minimum. Before disease germs can be eliminated, it is necessary to secure accurate knowledge of their nature and source, and then to devise methods of getting rid of them. This work has been largely accomplished in the United States so far as human and bovine tubercular germs are concerned. Work is also in progress through the area-plan and blood-testing of herds to eliminate Bang's disease in cattle. When this purpose is accomplished, undulant fever of man derived from bovine sources will disappear. Udder infections (mastitis) that cause the milk secretion to become abnormal are being controlled through physical examinations by veterinarians, laboratory examinations of milk and the better methods of herd management used by dairymen. Fortunately, the disease germ or germs that cause this very prevalent disease in cattle do not

so far as is known, cause human disease. A closely related human streptococcus infection that may be transferred to cattle under certain special conditions does cause epidemics of septic sore throat, scarlet fever, erysipelas and related diseases of human beings. The control of this type of disease germ has proved difficult, pasteurization being our only real safeguard against this disease germ.

Unfortunately, at the present time there is a tendency in the United States to spend an undue amount of energy and valuable time in getting some *harmless types of bacteria* out of our milk supplies. These bacteria are usually detected only, because of the fact that they are difficult to kill during the pasteurization process. Efforts might better be concentrated on the extension of pasteurization as a blanket means of protection against milk-borne diseases and upon the eradication of diseases that may be transmitted to human beinges from our milk producing herds. A well-balanced milk inspection program will not only maintain the total number of bacteria in a milk supply below a certain reasonable minimum, but it will also result in the control or eradication of undesirable disease germs in the milk supply.

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LIST OF AGRICULTURAL FILMS

UNION OF SOUTH AFRICA †

FILM TITLE	SUMMARY
Agricultural Education and Extension.	—
Cattle Ranching.	—
Sheep and Wool.	—
Dairying.	—
Wheat and Maize.	—
Veterinary Services.	—
Forest Management.	—
Irrigation.	—
Deciduous Fruits.	—
Viticulture.	—
Stellenbosch University.	—
University of Pretoria.	—
Citrus Culture.	—

ARGENTINA §

Obtención de carne argentina (*Meat production in the Argentine Republic*) (*5 parts*).	Ranches, installations and equipment, prophylactic methods, general stockyards, stockyards for steers, veterinary inspection in the country, harness, transport of the steers to the refrigeration and packing plants where all the operations up to the time of exporting the meat are carried out under the direct supervision of veterinary surgeons attached to the Ministry of Agriculture.
Cosecha y transporte de los cereales a granel (*Harvesting and transport of cereals in bulk*) (*4 parts*).	Wheat harvesting, intermediary silos, diagrams of their construction, granaries and transport to an agricultural establishment, etc.

* See also this *Bulletin* 1942, No. 9, pp. 323-347.
† Communicated by the Department of Agriculture and Forestry, Union Buildings, Pretoria.
§ Communicated by the Delegate of Argentina on the Permanent Committee of the International Institute of Agriculture.

IN THE VARIOUS COUNTRIES *

UNION OF SOUTH AFRICA

Publisher	Producer	Length in feet **	Synchro-nized sound or talking	Silent	Date of release
—	Africa Film Productions, Ltd., Johannesburg.	1688	—	+	1936
—	»	1721	—	+	1936
—	»	1027	—	+	1936
—	»	2096	—	+	1936
—	»	1642	—	+	1936
—	»	2043	—	+	1936
—	»	2155	—	+	1936
—	»	1525	—	+	1936
—	»	1307	—	+	1936
—	»	700	—	+	1936
—	»	903	—	+	1936
—	»	1033	—	+	1936
—	»	815	—	+	1936

ARGENTINA

		Length in metres			
Sección foto-cinematográfica del Ministerio de Agricultura de la Nación.	—	1500	—	—	1935 to 1938
»	—	1055	—	—	1935 to 1938

** Cape feet. 1 Cape foot (Kaapse voet) = 0.31486 m.

ARGENTINA (*continued*)

FILM TITLE	SUMMARY
Mendoza (Tierra de bellezza y promisión (*Mendoza, land of beauty and promise*) (*6 parts*).	Beauty, wealth and industries of the province, different trips and excursions.
La técnica en la producción del trigo (*The technique of wheat production*) (*2 parts*).	The process of genetics to obtain the best varieties carried out at an Experimental Field of the Ministry of Agriculture.
El valor panadero de los trigos (*The baking quality of wheats*) (*2 parts*).	Determination of the baking quality of wheats with indicative diagrams, carried out at the Laboratory for milling and panification of the Ministry of Agriculture.
Fruta de Río Negro (*Fruits of Río Negro*).	Irrigation works, dikes, primary and secondary canals, farm irrigation. Harvesting system, transport to grading and packing plants, cleaning; mechanical grading of fruits, packing for home consumption and for export, shipping on refrigerator cars.
Apicultura argentina (*Argentine apiculture*) (*3 parts*).	Formation of hives, from collecting natural swarms, transport to the hives, location of the queen bee, etc. up to extraction of the honey.
San Juan (Tierra de Sarmiento) (*San Juan, the native land of Sarmiento*).	Regional film covering irrigation works, plantations, roads, bridges and the trip across the hillsides up to the fertile valley of Calingasta.
Semilleros fiscalisados por el Ministerio de Agricultura de la Nación (*Nurseries controlled by the National Ministry of Agriculture*).	Inspection visits of crops by technicians, control of seed production and packing, etc.
La Patagonia panoramica (*Panoramic Patagonia*) (*2 parties*).	Some districts of Patagonia, ports of the Atlantic Ocean, roads, means of transport, parks, farms, fertile valleys, rivers, pools, the Argentino Lake, and other natural beauty spots of the region.
Los lagos del Sud. Hermosa región de turismo (*The lakes of the South. Picturesque region for pleasure travel*).	Lake Nahuel Huapí: trip across the lake, aspects of its environs. Lake Moreno, Lake Frías, Correntoso, etc., forest, mountains, waterfalls, the Encantado del Traful Valley, and salmon fishing in the Traful River.
Córdoba y sus bellezas, paseo de turismo en el centro de la República (*Cordoba and its varied beauty, holiday resort in the centre of the Republic*).	Town, mountain roads, rivers, San Roque and Río Tercero dikes.
La fiesta de la vendimia en la provincia de Mendoza (*Festival of the grape harvest in the Province of Mendoza*).	National, provincial authorities and competitors at this work festival, at which each Department symbolizes its spirit by allegorical chariots and by a 'queen', one of whom obtains the queen's crown for the grape harvest of the Province.

ARGENTINA (*continued*)

Publisher	Producer	Length in metres	Synchronized sound or talking	Silent	Date of release
Sección foto-cinematográfica del Ministerio de Agricultura de la Nación.	—	1620	—	—	1935 to 1938
»	—	555	—	—	1935 to 1938
»	—	375	—	—	1935 to 1938
»	—	365	—	—	1935
»	—	990	—	—	1935
»	—	850	—	—	1935
»	—	550	—	—	1935
»	—	620	—	—	1935
»	—	700	—	—	1935
»	—	250	—	—	1935
»	—	200	—	—	1935

ARGENTINA (*concluded*)

FILM TITLE	SUMMARY
La industria del portland en la Argentina (*The Portland cement industry in the Argentine Republic*) (*2 parts*).	Quarries and factories of the country, exploitation of the mines and the methods employed up to packing of the Portland cement.
Un certamen de la Sociedad Rural Argentina (*A contest held by the Argentine Rural Association*) (*2 parts*).	The great contest held in May of 1938 by the Argentine Rural Association; the jury and the work of selecting the products, determination of the winners, inauguration of the contest by the President of the Republic and the highest authorities of the country. Procession of champions and prize winners. The products of the competition originate from imported stock to which they are much superior.

AUSTRALIA *

VICTORIA	
A Story of Agricultural Research.	Shows some of the activities of the Department of Agriculture, particularly in relation to wheat breeding work, pasture improvement and dairy research.
Reworking Deciduous Fruit Trees.	Deals with different methods of reworking deciduous fruit trees to other varieties by means of both grafting and budding.
TASMANIA	
The Fat Lamb Industry.	All phases of the fat lamb industry.
The Tobacco Industry.	Production of the crop and the diseases associated with it.

* Communicated by the Minister for External Affairs, Commonwealth of Australia, Canberra.

NOTE. — Films have been produced by different States and by the Commonwealth. Those produced primarily for publicity purposes. A number of them however, have some educational value, but scarcely below. The list comprises the films produced up to the end of December, 1938.

ARGENTINA (*concluded*)

Publisher	Producer	Length in metres	Synchronized sound or talking	Silent	Date of release
Sección foto-cinematográfica del Ministerio de Agricultura de la Nación.	—	500	—	—	1935
»	—	500	—	—	1938

AUSTRALIA

Publisher	Producer	Length in feet ** 35 mm. wide	Length in feet ** 16 mm. wide	Synchronized sound or talking	Silent	Date of release
The Publicity Branch of the Department of Agriculture.	—	—	1.600 ft	+		July, 1938
»	—	—	800 ft	+		October, 1938
The Tasmanian Department of Agriculture.	—	—	—		+	
»	—	—	—		+	

** 1 foot = 0.3048 m.

by the Commonwealth (Cinema Branch of the Department of Commerce) deal with agricultural subjects, in a technical sense, or for those actively engaged in agricultural pursuits. These films are indicated

AUSTRALIA (*concluded*)

FILM TITLE	SUMMARY
GOVERNMENT OF THE COMMONWEALTH	
Concentrated Sunshine.	Australia's dried vine fruits industry.
Fruit Canning.	Cultivation and canning of peaches.
Australian Butter.	Showing dairy herds, milking, interior of butter factory, grading for export, and shipment.
Australian Eggs.	Depicting poultry industry on a large scale, grading shell eggs for export, and preparation of egg pulp.
The conquest of the Prickly pear (*2 reels*).	The story of the successful eradication of the prickly pear pest by scientific methods.
Australian Oranges.	Cultivation and export of citrus fruit.
Australian Apples.	The cultivation, grading and export of Australian apples.
Australian Bananas.	The banana industry in Queensland.
Australian Sugar.	Showing plantations in Queensland, cane cutters at work, and the interior view of sugar mills.
Australian Pineapples.	Cultivation, harvesting and canning of pineapples for export.
The Golden Fleece.	Australia's wool industry, mustering, shearing, classing and scenes of overseas buyers operating at the wool sales.
Among the Hardwoods.	Western Australian hardwood industry.
The Vineyard of the Empire.	Cultivation, harvesting and manufacture of wine, both still and sparkling.
Tobacco.	Survey of Australia's tobacco industry from the cultivation of the leaf to the manufactured article.
Golden Grain.	Depicting large scale wheat farming in Australia and illustrating the part played by harvesting machinery.

AUSTRALIA (*concluded*)

Publisher	Producer	Length in feet: 35 mm. wide	Length in feet: 16 mm. wide	Synchronized sound or talking	Silent	Date of release
Department of Commerce, and Cinema Photographic Branch	-	1010 ft.	404 ft.	+		
»	—	620 ft.	248 ft.	+		
»		1030 ft.	412 ft.	+		
»		970 ft.	388 ft.	+		
»	-	1360 ft.	544 ft.	+		
»	-	750 ft.	300 ft.	+		
»		730 ft.	292 ft.	+		
»	-	815 ft.	326 ft.	+		
»	-	830 ft.	332 ft.	+		
»	-	910 ft.	364 ft.	+		
»		870 ft.	348 ft.	+		
»	-	1000 ft.	400 ft.	+		
»	-	985 ft.	394 ft.	+		
»	-	994 ft.	398 ft.	+		
»	—	756 ft.	303 ft.	+		

MISCELLANEOUS INFORMATION

German-Bulgarian Agricultural Institute

According to a communication of the 'Nationalsozialistischen Landpost' of August 7, 1942, negociations, which were concluded on July 27 of this year, were held between the German and Bulgarian authorities; the result is the creation of a German-Bulgarian Agricultural Institute. The new Institute will be erected at Sophia and be similar to an Emperor William Institute. The Statutes have been elaborated and have to be approved by the two States. The Administrative Board will be composed of six representatives of each State, the position of President being held by a German and a Bulgarien alternatively. A German Council and a Bulgarian Council will each be controlled by a director and the two directors will be the heads of the Institute. Expenses will be divided between the two States; the buildings will be constructed with capital from the Emperor William Institute. The foundation stone was laid on August 31.

I. M.

Safflower as an oil-yielding plant

Safflower (*Carthamus tinctorius* L.) is an annual composite plant originating from the East. Its cultivation, of very ancient date, extends over Algeria, Southern France, Hungary, Spain, Germany and Russia up to India. It is also found in the United States and in Argentina.

Formerly, safflower was well known for the colouring matter it contains, carthamin ($C_{25} H_{24} O_{12}$), found chiefly in the tubulous flowers, and which was utilized by the Egyptians to colour the burial wrappings. In other countries, this substance was employed principally in the silk industry, but this use was abandoned owing to the poor resistance of the colour. The flowers were used and still are, although to a lesser extent, for the adulteration of saffron and the preparation of rouge. Practically all these applications are no longer in use and at present this plant is of importance solely from the standpoint of oleaginous properties.

Although safflower is very resistant to drought, it requires adequate moisture during the germination period and at the time of flowering. Excessive cold and prolonged rain are very harmful. The sun and heat, on the other hand facilitate its growth and assure the development of the achenes and a high oil content. During its development, the plant is very resistant to cold which, however, is very harmful at the time of the formation of the achenes. This is only the case, however, for late crops, as the biological cycle of the safflower is from 100 to 120 days and sowing is carried out in spring, from March 20 to the beginning of May, according to region and climatic conditions.

Before sowing, the land should be ploughed 18 to 25 cm. deep, and care should be taken to eliminate all weeds which interfere greatly with the growth of the crop.

If the soil is too dry at the time of sowing, it should be irrigated; irrigation is of great advantage when effected before flowering. Repeated irrigation, however, would be detrimental. Safflower requires little manuring and phospho-potassic fertilizers are to be preferred for the production of the flowers and subsequent achenes which are the most important.

When the soil is sufficiently warm and moist at the time of sowing, the seeds come up within four or five days. According to CAROCCI-BUZI and LAGANÀ, 13 to 15 kg.

of achenes are required to sow a hectare of land. F. RABAK recommends 50-60 lb. per acre of good hard seed with a high germinative power and well selected, weighing 44 to 48 lb. per bushel. In Russia, the seed is sown broadcast, 10 to 12 kg. being used per hectare. Sowing should be uniform and the plants not too crowded in order to allow sufficient space for branching and flowering. The distance between the rows should be from 35 to 45 cm. with a spacing of 25 to 30 cm. in the rows. The achenes for seed should be clean and kept in a dry place.

The crop can be harvested gradually, when the leaves begin to yellow. In Africa, the average yield of safflower achenes is from 4 to 5 qls. per hectare; with Mediterranean and Asiatic crops, this average yield may attain 6 to 8 qls. in non-irrigated fields and 7 to 10 qls. in irrigated fields, with a maximum of 10 to 12 qls., which corresponds to the production of other plants as, for example, the sunflower.

A detailed study on the safflower was carried out in 1938-39 by A. SCHEIBE and C. VON KURSELL. Experiments were undertaken with populations of *C. typicus* and *C. inermis* of 15 different origins. The highest yielding varieties were subjected to selection through strains and hybridization. The results of these experiments are not yet available.

The European varieties with the highest yield and the highest oil content are those originating in Zurich, Frankfort, Modena, Trieste, Brussels and Posen. Using as a basis the results of the special botanical and biological research work effected at the University of Giessen, it has been possible to clear up several points regarding the future possibilities of this crop. The varieties originating in Trieste yield an achene (hulled) containing 53 per cent. fat, 30.33 per cent. crude protein and over 95 per cent. dry matter. Those of Zurich produce over 95.4 per cent. dry matter, 53 per cent. fat and 31.17 per cent. protein; those of Posen 52.82 per cent. fat and 31.96 per cent. protein, and those of Modena 52.76 and 31.66 per cent. respectively. In Russia, both the prickly and the thornless *C. typicus* have been bred. In the case of the thornless variety, the achenes from Transylvania give the best yields. The selections obtained in Afghanistan and in France (with early, not very spiny varieties, although with a lower yield) are the best. In Central Asia, practically 70,000 hectares are cultivated to safflower. In this region, the oil content of the unhulled achenes varies between 26 and 35 per cent.

In the United States, feeding experiments with safflower presscake and meal were made by the Bureau of Dairy Industry, Beltsville. It was found first of all that safflower presscake and meal do not contain toxic substances and that they can compete advantageously with linseed, soybean and cottonseed presscake. Rich in protein, their content in this substance is much the same as that of cottonseed presscake and meal. Also presscake made from the whole seed has about the same nutritive value of coconut meal. Safflower presscake has a higher crude fibre content and is particularly suitable for cattle and sheep which digest the fibre well. Safflower meal as a stockfeed has no harmful action on the production and quality of milk and meat and has no laxative properties.

The experiments carried out at the Agricultural Experiment Centre of Morocco (J. CADIOT) gave the following results.

As a dye plant, safflower may give, with good cultivation, unit yields of from 100 to 120 kg. of dried flowers, while a good saffron plantation, from the second year, only furnishes 10 to 15 kg. of the commercial product. Seed production evidently varies appreciably according to cultivation conditions, rainfall and the variety used. At the Agricultural Research Centre where safflower has been cultivated uninterruptedly for over ten years, the average and unit yields were from 20 to 25 qls. of seed

weighing 50-51 kg. per hectolitre, with a maximum exceeding 35 to 40 qls. for the thorny varieties. The spineless varieties, less productive, but, on the other hand easier harvested than the former owing to the absence of prickly appendages on the leaves and the flower-heads, give average yields of 18 to 22 qls.

Although less rich in oil than the majority of the other annual oil-yielding plants cultivated in Morocco (linseed, groundnut, sesame, colza, sunflower), the safflower, however, can produce, because of its high yields, a quantity of oil per hectare which may be estimated at four quintals (20 qls. of seed at 20 per cent.), figure exceeding appreciably that which may be expected from a good sunflower crop. Yields of the dried stems without the flower-heads are from 130 to 150 qls. per hectare.

In Rumania, Prof. N. SAULESCO, of the Faculty of Agriculture at Bucharest, effected experiments in different regions of the country with different varieties and obtained the following results:—

Varieties	Weight per hl. in kg.	Weight of 1000 achenes in	Kernel	Sheath	Oil content of decorticated fruit		Germinative power	
	kg.	gm.	%	%	%		%	
Locale	60.80	32.96	41.61	58.39	51.8 / 51.3	= 51.55	N 90.4 / S 1 5	= 95.4
Yenica 1813 (Baragan)	39.48	17.53	30.67	69.33	38.8 / 39.1	= 38.95	N 30.9 / S 1 21.3	= 52.2
Yenica 1813	35.73	21.30	38.12	61.88	37.6 / 36.0	= 36.80	N 23.0 / S 1 29.5	= 52.5
Bessarabia	49.20	43.30	32.28	67.72	44.8 / 45.5	= 45.15	N 45.5 / S 1 46.0	= 91.5
Anatolia	36.00	18.00	41.40	58.60	39.4 / 39.6	= 39.50	N 23.2 / S 1 17.7	= 40.9
Giessen	60.00	36.03	39.42	60.58	51.4 / 50.5	= 50.95	N 94.2 / S 1 2.0	= 96.0

In Russia, it is considered that safflower will have a certain future as an oil-yielding plant: it is resistant to drought and practically exempt from cryptogamic diseases and parasite attack. It is not affected by locust invasions.

On the other hand, the quantity of oil which can be obtained from safflower is superior to that from the sunflower and the quality of the product is better.

In general, the average yield of unhulled seed is from 25 to 27 per cent. The oil is usually extracted from the meal after decortication and separation of the fibre residue by means of modified cottonseed hulling and separating machines.

Forty-three per cent. of meats or meal and 57 per cent. hulls are obtained; a certain proportion of fibre (8 to 10 per cent.) should be left in the mass in order to ensure maximum efficiency of the hydraulic press and expeller.

The oil extracted by hydraulic pressure or by solvent has a red-gold colour, without odour or characteristic taste. This product has the advantage of possessing good drying properties. It is a good substitute for linseed oil and may be employed in the varnish, linoleum and allied industries. It is easily refined and bleached; on heating in a closed vessel for an hour at a temperature between 307 and 310° C., a gelatinous mass is obtained which can be employed for the greasing of leather, the manufacture of linoleum and for other uses. The free fatty acid content of the oil immediately after extraction, is from 4 to 5.85 per cent. (expressed in oleic acid). Kept in closed receptacles, this oil acquires a pungent taste and easily becomes rancid.

The chief characteristics of safflower oil are:—

Specific gravity	0.925 to 0.938
Melting point	5° C.
Melting point of liquid fatty acids	from 11 to 17° C.
Freezing point	13 to 18° C.
Acetyl value	53 (fatty acids)
Saponification number	186-195
Iodine value (Hübl.)	142.2
Refractometric index (Zeiss)	at 25° C. 77-78
Unsaponifiable	0.708 per cent.

As residue after extraction of the oil are presscake and meal having the following chemical formula:

	Moisture	Ash	Crude protein	Crude fibre	N-free extractives	Fats (Ether extract)
	%	%	%	%	%	%
Presscakes from:						
Decorticated achenes	8.97	8.18	38.06	20.96	17.06	6.77
Unhulled achenes	4.10	2.90	19.20	42.60	25.40	5.80
Meal (solvent treatment)	7.91	3.02	16.62	45.64	24.96	1.85

It may be deduced from the foregoing that:—

(*a*) Safflower adapts itself to practically all soils, arid lands and average types; its yield in achenes is only a little lower than that of sunflower (6.5 to 10 qls. per hectare); the average yield in oil from safflower cultivated in some regions is superior to that obtained from sunflower (25 to 28 per cent. for the formers against 15 to 18 per cent. for the latter). Safflower oil can be employed as an edible oil and as a substitute for olive oil. In some countries like French Morocco, it is used principally as a tanning and colouring substance; while in others, it is utilized mixed with saffron. Safflower oil is a quick-drying oil and serves as a good substitute, and sometimes even advantageously, for other similar products such as linseed oil, in the manufacture of white paints and enamels, linoleum, etc.

The experiments carried out by Dr G. Stampa in 1924 showed that by hydrogenizing safflower oil a kind of butter was obtained, yellowish-white in colour, perfectly stable, with practically no taste or odour, having the consistency of pure butter, sometimes even firmer according to the degree of hydrogenization.

(*b*) According to C. von Kursell, the oil yield of the varieties *C. typicus* and *C. inermis* is more or less the same. The studies made in Russia have proved that the variety *C. typicus* is undoubtedly superior in this respect.

(*c*) The presscake and meal obtained on extraction of the oil, in view of their protein content, constitute a good stockfeed.

(*d*) The residue of the plant and the sheaths of the achenes may serve for various uses, namely:

(1) extraction of the cellulose and utilization of the fibre;

(2) as a fuel, employing a suitable furnace (for example, the Del Rosso furnace);

(3) manufacture of alcohol, furaldehyde, xylose (resins, plastics, fuels, acetones, lactic acid, etc.) from the residue left after decortication.

In short, it is a question of a plant which, while being a crop cultivated since ancient times, has only been developed and utilized in recent years, with a view to obtaining the highest yield at a time when self sufficiency constitutes the primary aim of countries poor in raw materials.

E. M. de B.

Publications consulted :—

Cadiot, J., Le carthame, oléagineux méconnu. — *Bulletin des Matières Grasses*, Marseille, 1941, nos 10-11, p. 181.

Rabak, F., Safflower, a possible new oil-seed crop for the Northern Great Plains and the Far Western States. — *United States Department of Agriculture, Circular No. 366*, Washington, D. C., 1935, pp. 1-14.

Scheibe, A., Zucht- und Anbauerfahrungen mit Saflor (*Carthamus tinctorius* L.). — *Pflanzenbau*, Leipzig 1938, 15. Jahrg., Heft 4, S. 129-159, Abb. 1-7.

von Kursell, C., Zuchtarbeiten an der neuen Ölpflanze Saflor. — *Pflanzenbau*, Leipzig 1939, 15. Jahrg., Heft 12, S. 463-482, Abb. 1-11.

BOOK NOTICES *

Kunz, Johann Isidor. *Der erfolgreiche Pflanze.* Olten, Verlag O. Walter, 1942, 763 S., mit 3 Vierfarben-Kunstdrucktafeln, 430 Bildern in Kunstdruck und 115 Textabbildungen.

As the sub-title ' Wir Schweizer als Selbstversorger ' indicates, this very opportune book treats on the cultivation of vegetables and fruits and small stock-raising based on the common standpoint of self-provisioning.

The extent of the problem is explained in detail in the introductory chapter by the agricultural engineer H. Keller ' Die Schweiz als Selbstversorgungsland mit Nahrungsmittel '. The three principal parts of the work: vegetable growing, fruit cultivation and small stock-raising, are each subdivided into several chapters, the drafting of which was entrusted to world-known experts in instruction and Swiss research.

* Reviews of books presented to the Library are given under this heading.

The chief aim of the work is to instruct and guide the large number of those cultivating small farms or plots. The chapters ' Practical vegetable growing for the small holder ', ' Cultivation of the fruit garden ' and ' Rational rabbit-breeding ' are especially written for them.

Attention has also been given to large and very large farms in view of their market importance. The following chapters deal particularly with these: ' Farm vegetable growing ', ' Vegetable cultivation in the open fields ' and ' The production and sale of vegetables '.

Particular mention should be made of the chapters by Dr WIESMANN and Dr HADORN which deal with the control of vegetable and fruit pests and diseases.

The illustrations are many and excellent.

N. G.

GAROGLIO, PIER GIOVANNI. *Trattato di enologia.* Enciclopedia vitivinicola moderna in cinque volumi, vol. 4, Firenze. « Il progresso vinicolo ed oleario », 1942, 844 pagg., 117 figg., 11 grafici. Price of the entire work in 5 volumes: Lire 350.

The author has assembled in the fourth volume of his masterly publication, a modern encyclopedia of viti-viniculture, two distinctly different aspects of the question. The first part regards the study of the causes, effects of and preventive and curative remedies for diseases of wines; namely everything comprised under the general denomination of the changes which take place in wines due to composition, preparation, external causes and to modifications brought about in wines by certain micro-organisms. According to a rather new classification, the author has divided into four branches all the physico-chemical, physical, chemico-physical and microbiological disorders of wines, with a view to adapting the different opinions to the laws of physical chemistry and to the latest knowledge acquired in applied microbiology.

It follows that numerous phenomena known only in empirical oenology and which a superficial examination led to believe solved, denote always to an increasing degree their complexity and the dubiousness of certain hasty deductions. In the future, the improvements attained in science will also have to be applied to this very important branch of oenology and steps taken to prevent the falling off and devalorization of the great agricultural wealth that is wine.

The second part of the volume treats on the rational working of wine and the by-products of the vine; it is supplemented by a comprehensive survey of all the industries which may, in a wide or narrow sense, be considered as secondary or related, from the fuel branch to that of animal husbandry and that of nutrition, namely, a whole series of industries which are and will be of still greater importance in the future such as distilleries, the industries of tartaric acid, vinegar, peptonization, yeasts, etc. The up to date publication of the present best industrial systems is divided into nine parts, subdivided into many chapters and is completed by numerous figures and a recent bibliography regarding the different problems.

G. S.

LARMAT, LOUIS. *Atlas de la France vinicole. Les vins de Bordeaux.* Paris, Louis Larmat, éditeur, 1941, 8 cartes. (Published under the patronage of the ' Comité National des Appellations d'origine des Vins et Eaux de Vie, du Comité National de Propagande en Faveur du Vin, du Syndicat National du Commerce en gros des Vins, Cidres, Spiriteux et Liqueurs de France '). Price: 250 francs.

In this publication printed in five languages (French, German, English, Italian and Spanish) which will form an inventory of one of the principal riches of France, M. LARMAT presents an admirable and concise documentation on the delimitation of the different wine districts for the production of the famous vintage wines and brandies of France. It was necessary to exclude from a wine-growing region called noble, the zones with clayey soil, with unfavourable exposure and humid which, planted to vines, would give rise to mediocre wines unworthy of the name and which would discredit the region in the eyes of the consumer. It was necessary at the same time to specify and delimit in each wine-growing region, the areas which are entitled to a brand name and even the vine varieties and methods of cultivation, in order to maintain intact the secular usages which had ensured their repute. Brands thus defined are called ' controlled or registered ' (Decree Law of July 30, 1935).

In drawing up his maps, M. LARMAT has taken as a basis the directing rules of the ' Comité National des Appellations d'origine des Vins et des Eaux-de-vie ', which since its foundation has issued several Decrees to designate the areas which, owing to geographical origin and agrological composition of the soil, environmental conditions and local usages, produce typical wines. These maps constitute a cadastral survey of all the areas in France which produce vintage wines.

This is an important work which summarizes the information supplied by the greatest experts on the subject: professors of geology of different Faculties, directors of oenological and agronomic stations, directors of agricultural Services.

The album ' The Wines of Bordeaux ' is only the beginning of this imposing work which is to be followed by maps of all the French wine-growing regions, to form, as has already been mentioned, the inventory of one of the chief riches of France.

G. S.

Prof. UGO PAPI, *Segretario generale dell'Istituto. Direttore responsabile.*

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MONTHLY BULLETIN

OF

AGRICULTURAL SCIENCE AND PRACTICE

NEW AGRICULTURAL BIBLIOGRAPHICAL SOURCES

Supplement to the 'Survey of current bibliographies on agriculture and allied subjects' (1937).

DR SIGMUND VON FRAUENDORFER

An essential condition for all scientific work is the knowledge of the studies carried out on any one particular subject in the past. Every serious student, therefore, should keep himself informed as accurately and as fully as possible on previous publications dealing with the problems which he is about to study. This very general observation which is applicable to all sciences, is particularly true for agriculture, because, in this branch, scientific research work is generally of great length, requiring considerable time and patience, frequently much space and complicated apparatus and consequently fairly heavy expense. To avoid duplicate use of time, expense and energy, and to prepare the ground for his own studies, it is very necessary, therefore, for the agricultural investigator to know the means of finding his way through the labyrinth of scientific literature which is continually increasing. The guides to obtaining information are bibliographies, but their knowledge generally leaves much to be desired.

Taking all this into account, the International Institute of Agriculture published, in 1937, a guide of existing sources of agricultural bibliography entitled 'Survey of current bibliographies on agriculture and allied subjects'. This was the first attempt in a field of work previously untouched. The 'Survey' inevitably contained gaps and deficiencies. Five years have past since its publication and a fairly large number of new publications of a bibliographical character and of agricultural interest have appeared during this period. It seemed advisable, therefore, to enter on the task of revising and completing the Survey by a kind of supplement, following the same criteria as the original work. The selection of agricultural bibliographical sources, now presented in the form of this article include a small number of early publications which, for some reason or other, were omitted from the Survey. The greater part of the periodicals noted, however, are of recent origin.

It is true that the present moment is not very propitious for a compilation of this type because, owing to the world conflict, the arrival of publications from some countries is sporadic or else has ceased entirely. The collection of new bibliographical publications, however, is not meagre, although it is very probable that some have been omitted because they have not been brought to our notice. Later, when conditions permit, it is thought to publish a second revised

and amplified edition of the Survey, in which will be incorporated the bibliographies reported in this supplement and similar publications wanting as yet or which will be published in the future. For the moment this modest selection which we present should be consulted simultaneously with the original edition of the Survey, of which it is nothing but the integration and supplement.

ARGENTINA

Ministerio de agricultura. República Argentina. Dirección de propaganda y publicaciones. **Boletín bibliográfico.** Buenos Aires; 1936—

Monthly. Title bibliography based on abstracts of the periodicals and bulletins received at the Library of the Ministry. Classified according to subject. International. Approximately 5,000 titles per annum.

Facultad de agronomía de la Universidad de La Plata. Biblioteca. **Fichas bibliográficas** correspondientes a los trabajos llegados a esta biblioteca. La Plata, 1936—

Monthly. Mimeographed on one side of the page only to facilitate clipping and filing. List of accessions of the Library of the Faculty. Not classified. Publications and articles from periodicals. International.

AUSTRALIA

Australian science abstracts; supplement to the Australian journal of science. Sydney, 1923—

Quarterly. Partially annotated bibliography of Australian scientific literature and on Australia. Includes a section Agriculture. *Material of agricultural interest is also found in the sections* Economics and statistics *and* Veterinary science.

BELGIUM

Bibliographia universalis silviculturae. Belgica. Groenendael, 1934— (Service spécial belge des expériences et Consultations scientifiques forestières).

Annual. Complete title bibliography of Belgian forest literature of general interest. Arranged systematically according to the Decimal Classification (Flury modification). The titles are printed on one side of the page only to facilitate clipping and filing. About 160 *titles a year..*

Bulletin de la Société centrale forestière de Belgique. Auderghem, 1893—

From time to time contains the Addenda au Catalogue *of the Library of the Association which is reproduced in numbers 4/5 and 6 of the Bulletin, year 1935. Arranged systematically. International.*

Institut national pour l'étude agronomique du Congo belge, (I. N. E. A. C.). **Fiches bibliographiques.** Bruxelles, 1938—

Fortnightly. Card bibliography, based on the abstracting of periodical publications and the stock works of the Library of the Institute on agricultural research in general and particularly on the development of tropical and subtropical countries. Each title is accompanied by a brief summary of the contents. Special classification indicated on each file card. About 3,000 cards per annum. International.

BOHEMIA AND MORAVIA (Protectorate)

Bibliografie lesnického pisemnictví Čech a Moravy. Bibliographia silviculturae Bohemiae et Moraviae. Pisek, Nakladem Matice lesnické, 1936—

Annual supplement to the review Lesnická prâce *since 1941. Formerly (first year treated: 1934) in the review* Dobové spisky Č. Matice lesnické. *Title bibliography of the forestry literature published in Bohemia and Moravia, arranged systematically (Decimal Classification, Flury modification). Alphabetical author index.*

Česká zemědělská bibliografie; vydává Ústředni zčmědelská knihovna České akademie zemědělské. Praha, 1941—[Czech agricultural bibliography, published by the Central Agricultural Library of the Czech Academy of Agriculture at Praha].

Irregular. Complete title bibliography of Czech publications (books and articles) on agriculture and allied sciences. Arranged systematically according to the Classification Scheme of Agricultural Science, *published by the International Institute of Agriculture. The signature of this scheme is added at the end of each title. About 2700 titles per year. Alphabetical author index.*

Družstevní sbornik. Organ Studijniho ústavu družstevního v Brně. Brno, 1940— [Cooperative annals. Organ of the Institute for studies on cooperation].

Quarterly. Includes a section Literatura *comprising fairly complete abstracts on subjects regarding cooperation and other economic questions. About 100 abstracts a year.*

Lesnická Práce; měsičnik vydávný Matici lesnickou v Pisku a věnovaný lesnické vědě a praxi. Pisek, 1922— [Forestry. Monthly review published by 'Matice lesnická' (Central organization of Czech foresters) at Pisek and dedicated to forestry science and practice].

Monthly. In one section abstracts are given of publications and articles of Czech and foreign periodicals dealing with forestry. Text in Czech. Approximately 75 abstracts per annum.

Ochrana rostlin; ročenka Komise pro ochranu rostlin. Praha, Svaz výzkumných ústavů zemědělských 1921— [Plant protection; Yearbook of the Commission for plant protection, edited by the Union of agricultural research institutions.]

Includes since 1939 (for the years 1937-38) an annual title bibliography entitled: Knihopis české ochrany rostlin (*second title in German;* Bibliographie der Tschechische Pflanzenschutzliteratur). *Covers articles on plant protection published in Czech periodicals. Alphabetical classification according to author. About 250 titles a year.*

Zemědělská literatura, recensní příloha Sborníku České akademie zemědělské. Praha, 1940. [Agricultural literature, supplement to the Annals of the Czech Academy of Agriculture].

Quarterly. Edited by J. Bostik. *Includes fairly complete abstracts of Czech and foreign publications. Arranged according to subject. Covers the entire field of agriculture. No longer published.*

BULGARIA

Agrarni problemi. (Problèmes agraires. Agrarprobleme). Sofia, 1938—

Bimonthly. Contains a list of publications, sometimes with summaries, on rural economy and allied subjects, chiefly in the Bulgarian language.

Lesovădska misăl; organ na Družestvoto na lesovăditě v Bălgarija. (Revue forestière; organe de la Société forestière bulgare). Sofia, 1932—

Bimonthly. Contains under the title Pregled na bălgarskata lesovădska knižnina *an annual title bibliography (from 1929) on Bulgarian forestry literature. Arranged alphabetically according to author. Very complete, about 200 titles per year. By way of exception the bibliography for the years 1935 and 1936 is found in the review* Gorski Pregled' *(Sofia). Prepared by* L. Tamamdžiev *and* Th. Dimitrov. *The years previous to the beginning of this bibliography are treated in a monograph* Ukazatel na bălgarskata lesovădska knižnina za petdeset godini (1879-1928), *(Index of Bulgarian forestry literature covering a period of fifty years (1879-1928), by* T. Dimitrov, *Sofia,* 1930.

Also includes in each number a selection of abstracts of books and articles on forestry. International.

Spisanie na zemědělskitě opitni instituti v Bălgarija. D-voto na Specialistitě v zemedělskitě opitni instituti v Bălgarija. Sofia, 1919— [Journal of the Institute of Agricultural Research in Bulgaria].

Irregular. Contains a current list of the books and periodicals received at the Library of the Central Institute of Agricultural Experimentation, and sometimes also a selection Referati i recenzii. *Covers the entire field of agriculture, with special emphasis on agricultural experiment and research problems. International.*

Vănšnă Tărgovija. Ministerstvo na Tărgovijata promišlenost'ta i truda. Direkcija na vănšnata tărgovija. Sofia, 1941— [Foreign trade review. Board of Trade, Industry and Labour. Department of Foreign Trade].

Monthly. Includes under the title Stopanska bibliografija *a title bibliography chiefly for the articles of Bulgarian periodicals on economics in general, agricultural economics and trade. Approximately 700 titles a year.*

FINLAND

Bibliographia universalis silviculturae. Fennia 1934— Helsinki, 1936 – (Metsätieteelinen tutkimuslaitos). [Forestry Research Institute of Finland].

Annual. Edited by Eino Saar. *Complete title bibliography of the Finnish publications on forestry. Systematically arranged according to the Decimal Classification (Flury modification). The titles are printed on one side of the page only to facilitate clipping and filing. Also published as a card bibliography. Approximately 400 titles per annum.*

FRANCE

Annales des épiphyties et de phytogénétique: organe des stations et laboratoires de recherches. Paris, Imprimerie national, 1913 – (Ministère de l'Agriculture).

Quarterly. Contains a section Documentation *which gives abstracts of new scientific publications relating to plant genetics, phytopathology, plant protection and agricultural zoology. The abstracts are signed and sometimes of considerable length. They refer mostly to foreign publications. At the end of each volume an author index and a classified index.*

Bibliographie météorologique internationale. (Nouvelle série). Paris, Société météorologique de France, 1933— (Office national météorologique et Société météorologique de France).

Annual. Continuation of the Bibliographie météorologique *published since 1853. Systematically arranged according to the Decimal Classification. More or less detailed abstracts, mostly signed, are given of the most important publications. Printed on one page only to facilitate clipping and filing. A combined alphabetical index of authors and some geographical names refer to numbers of the Decimal Classification. Each volume contains about 2,000 citations and numerous references. A great many of the publications cited are of special interest to agriculturists. International.*

Etudes agricoles d'économie corporative. Paris, Librairie générale de droit et de jurisprudence, 1941—

Bimonthly. Contains a section Revue des livres *in which are given fairly complete abstracts of new publications, and another* Revue des revues *which reports the articles given in periodicals. Arranged according to subject. Refers almost exclusively to publications in the French language.*

Revue de droit rural et d'économie agricole. Paris, Librairie générale de droit et jurisprudence, 1939—

Quarterly. The section Documents *contains a* Table des textes législatifs et des principaux documents officiels (*in systematical order*), *a* Bibliographie méthodique (*only in No. 3/4*) *on the economic and juridical aspects of agricultural production, and* Comptes-rendus. *The first two sections regard legislation and French literature. No longer published.*

Revue internationale des industries agricoles. Paris, Commission internationale des industries agricoles. 1939—

Quarterly. The principal part entitled Index bibliographique *is a wide selection of abstracts of a large number of French and foreign periodicals. Titles of the articles in French, though for works in other languages the titles are also given in the original language. Refers to numerous branches of agriculture* (*General, Agronomy, Agricultural Industries*) *while giving special importance to the technology of Agricultural industries. Systematically arranged. Also contains an* Index des Brevets *and a section* Bibliographie *giving rather detailed book reviews. About 3,000 citations of articles and 400 abstracts of publications.*

GERMANY

Allgemeines statistisches Archiv. Jena, G. Fischer, 1890—

Quarterly. The section Literatur *contains signed reviews of the new statistical and economic publications. In addition* Eingegangene Bücher und Zeitschriften under which heading information is also found on the contents of journals. International.

Archiv für Kleintierzucht (Nachfolge des 'Archiv für Geflügelkunde'). Berlin, Pfenningstorff, 1940—

Monthly. Contains a section Referate *comprising approximately 70 abstracts per volume on poultry breeding and the raising of rabbits and other small domestic animals. International.*

Reichsnährstand I B 5 (Archiv und Bibliothek). **Bücherzugangsliste.** [Berlin], 1937—

Irregular. Mimeographed. Lists the titles of the new works acquired by the Reichsnährstand *Library. Classified according to subject. Economic, political and general culture subjects predominate. Approximately 1200 titles per annum. Restricted to German publications.*

Das deutsche Rechtsschrifttum; monatliches Verzeichnis der juristischen Buch- und Zeitschriftenliteratur. München, Zentralverlag der NSDAP, Franz Eher Nachf., 1938—

Monthly. Bibliography covering the entire field of German law and legislation. Systematic classification. Under each heading are given first publications

and then periodical articles. The titles of the books are sometimes accompanied by brief descriptive notes. Agricultural problems under Siedlungsrecht, Bauernrecht *und* Bodenrecht. *Each number contains an author and subject index. Annual index in two sections;* Bücher (*arranged alphabetically*)*:* Zeitschriftenaufsätze (*arranged according to subject. As from July, 1942 contains a semi-annual annexed supplement* Italienisches Rechtsschrifttum, *and gives a bibliographical list of the new Italian juridical publications including agricultural law.*

Die Ernährung; Zeitschrift für das gesamte Ernährungswesen in Forschung, Lehre und Praxis. Leipzig, J A. Barth, 1936—

Monthly. Contains under the titles Zeitschriftenschau and Buchbesprechungen, *two series of signed reviews dealing with physiology, chemistry, hygiene and other aspects of human nutrition. Approximately 300 abstracts per year. Alphabetical subject index.*

Fortschritte der Botanik; unter Zusammenarbeit mit mehreren Fachgenossen, herausgegeben von Fritz von Wettstein. Berlin, Springer, 1932—

Annual. Systematical classification according to the principal branches of botany. For each subject a synthetic summary, very complete and well thought out, followed by a bibliographical list of authors and the works cited in the summary. Besides a very large number of publications on pure botany there are many of agricultural and forest interest particularly in the chapters on reproduction, phytogeography, assimilation, genetics, etc. International.

Fortschritte im Gartenbau 1934-1936;—; herausgegeben von der Studiengesellschaft für Technik im Gartenbau. Frankfurt/Oder u. Berlin, 1937—

Annual. Systematic compilation of abstracts of recent publications on horticulture in general, floriculture, fruitculture and truck gardening, as well as technical questions regarding horticultural management and exploitation. Abstracts some fifty horticultural reviews of different countries. The source is cited but the original title of the work analyzed is seldom given. Alphabetical catchword index.

Geographisches Jahrbuch. Gotha, Justus Perthes, 1866—

Annual. Edited by L. Mecking. *Contains general reviews on the progress of geographical research in the world. Each section is preceded by a list of publications after which comes the text of the abstract. The different parts of the yearbook are written by collaborators of various countries. Contains much material of agricultural interest, particularly in the* Länderkunde *Section, which treats on the literature of different countries. International.*

Holz als Roh- und Werkstoff. Berlin, Springer, 1937—

Monthly. Contains a section Schrifttumsberichte *composed of signed reviews of international literature on timber (including botany, forestry, technology, industry, etc.). Classified according to a special system elaborated for the purpose, which follows the principle of the decimal system and which is reproduced in the*

first number (Oct.-Nov., 1937) of this periodical. In addition there is a Patentschau *for German and foreign patents and a column* Buchbesprechungen. *An alphabetical subject index serves as a general key for all sections of the periodical.*

Ibero-amerikanische Bibliographie; Verzeichnis der deutschsprachigen Literatur. Berlin, F. Dümmlers Verlag, 1930— (Beilage zu 'Ibero-amerikanisches Archiv' und zu 'Länder und Völker').

Quarterly. Compiled by H. Praesent. *General title bibliography of the publications in German on Spain, Portugal and Latin America. Classified according to country. Subjects of agricultural interest are found in the subdivisions* Wirtschaft *and* Land- u. Forstwirtschaft.

Internationale Agrarrundschau; herausgegeben von der Studiengesellschaft für deutsche Wirtschaftsordnung E. V. (Studiengesellschaft für Nationalökonomie, Berlin). Berlin-Schöneberg, Theodor Weicher, 1938—

Monthly. Contains two sections of bibliographical character; Zeitungs-und Zeitschriftenschau *and* Buchbesprechungen. *The abstracts are signed but are very brief. Refer almost exclusively to German publications. The political, economic and juridical aspects of agriculture predominate. Approximately 700 articles listed and 300 abstracts per annum.*

Internationale Titelsammlung für das Jahr 1937 – Neudamm, Neumann [1938]—(Beihefte zur forstlichen Rundschau der Zeitschrift für Weltforstwirtschaft).

Compiled by F. Grünwoldt. *Quarterly (since 1939). International title bibliography covering world literature on forestry in all its aspects. Systematical classification. Alphabetical subject index.*

Just's botanischer Jahresbericht. Systematisch geordnetes Repertorium der botanischen Literatur aller Länder. Berlin-Zehlendorf, Bornträger, 1873—

Irregular. Universal bibliography of botanical literature. Title bibliography, in part with brief explanatory notes. Systematical classification. Of particular interest for agricultural research are the sections on phytogeography, mycology, physical and chemical physiology. Very complete annual author and subject (including plant names) index. International.

Koloniales Schrifttum. Mitteilungen der Deutschen Kolonial-Bibliothek. Berlin, 1938—

Monthly. International title bibliography embracing the entire field of colonial problems. Systematically arranged. Includes a chapter Land-und Forstwirtschaft, *but also other sections, in particular that on local studies, which frequently contain material of agricultural interest. Approximately 3,000 titles per annum. No index.*

Literaturnachweis des Wohnungs- und Siedlungswesens; vereinigt mit Jahrbuch der deutschen Siedlung. Berlin, Verlag Siedlung und Wirtschaft, 1936—

Annual. Edited by R. v. Mangoldt. *The 1st volume (published 1936) covered the years 1933 and 1934. Title bibliography (publications and articles) occasionally with brief explanatory notes. Alphabetical catchword classification. For each subject;* A. Schrifttum (*if necessary separately:* Statistische Angaben) *and* B. Gesetze. Verordnungen. Erlasse. *Sections of special agricultural interest: 'Bodenfrage, Bodenpolitik, Grundbesitz, Grundbesitzwechsel, Landarbeiterwohnungen, Ländliche Siedlung and Bauerntum'. List of periodicals abstracted. Alphabetical author index. Restricted to German publications.*

Ostasiatische Rundschau; die Zeitschrift für den Fernen Osten. Hamburg, Hanseatische Verlagsanstalt, 1920—

Monthly. Includes under the title Ostasien-Bibliographie a *bibliographical section which reports the titles of the new publications in the German language on the Far East. Arranged according to country. Contains subjects of agricultural interest.*

Petermanns geographische Mitteilungen. Gotha, Justus Perthes, 1855—

Monthly. In each number appears a section called Geographischer Literaturbericht *which consists of one part reserved for abstracts of new geographical works and another which gives the titles of new publications issued either separately or else printed in geographical periodicals. Arranged geographically, except for the part on periodicals, where the articles are indicated under the title of the journal. Many references of direct interest to agriculturists. International.*

Schrifttum aus dem Gebiet des Pflanzenbaues und der Pflanzenzüchtung; für den Reichsverband der Pflanzenzucht zusammengestellt im Schrifttumsamt des Forschungsdienstes. [Berlin], 1939—

Irregular. Compilation of abstracts on plant cultivation and breeding from the agricultural eand horticultural standpoint. International.

Vitamine und Hormone; Zentralorgan für das gesamte Forschungsgebiet. Leipzig, Akademische Verlagsgesellschaft Becker & Erler Kom. Ges., 1941—

Irregular. Contains a section Referate, *part of which is of particular interest as regards agricultural research. About 350 abstracts per year. There is also a section* Patentreferate *and a list of new publications and treatises. Very detailed author and subject index. International.*

Volkskundliche Bibliographie; im Auftrage des Verbandes deutscher Vereine für Volkskunde 1917. Berlin, Walter de Gruyter, 1919—

Annual. Title bibliography of international character sometimes with brief explanatory notes. Covers the entire field of folk-lore and includes much material of agricultural and rural interest, particularly in the sections on settling, housing, alimentation, popular meteorology, social and juridical problems, etc. Arranged according to subject. Author and subject index.

Zeitschrift für Untersuchung der Lebensmittel; Fortsetzung der 'Zeitschrift für Untersuchung der Nahrungs-und Genussmittel sowie der Gebrauchsgegenstände'. Berlin, Springer, 1898—

Monthly. Contains a section Referate *giving signed reviews of new works (publications and articles) regarding the study and analysis of food substances. Arranged systematically. The majority of the titles reported directly or indirectly interest agricultural research. International.*

Zugänge der Bibliothek des Reichsinstituts für ausländische und koloniale Fortswirtschaft und der Universität Hamburg (Lehrstuhl für Weltforstwirtschaft und koloniale Walderschliessung). Reinbek, 1939—

Monthly. Mimeographed. List of new acquisitions (books, pamphlets, bulletins, reprints) of the Library of the Institute of the German Reich for Foreign and Colonial Forestry. Classified alphabetically according to author. Approximately 1,300 titles per year.

GREECE

Agrotikē oikonomia; Trimēniaia ekdosis geōrgikēs oikonomias kai agrotikēs politikēs. Athēnai, Ekdosis 'Phlamma', 1935— (Economie rurale; publication trimestrielle d'économie agricole et de politique agraire).

Quarterly. Contains a section Bibliokrisia *for abstracts of publications on rural economics and a list of the titles of new books dealing with the same subject. International.*

HUNGARY

Magyar statisztikai szemle; Szerkeszti és kiadja a M. Kir Kösponti Statisztikai kivatal. (Revue hongroise de statistique, rédigée et publiée par l'Office central de Statistique du Royaume de Hongrie.) Budapest, 1922—

Monthly. Contains in each number reports of books with signed abstracts of some new publications in the sphere of statistics and political economy. There is also a title list of the publications received at the Library of the Hungarian Central Bureau of Statistics particularly well supplied with official publications of a statistical character, and a section dealing with the contents of the most important economic and social journals. International.

A magyar szociografiai intézet közleményei. (Mitteilungen des Ungarischen soziographischen Instituts). Budapest, 1941—

Quarterly. Contains in each number Társadalomtudományi bibliográfia, *a title bibliography of social sciences in a rather wide sense. Works and articles reviewed. Systematically arranged according to the Decimal Classification (modified). Subject material of agricultural interest is found in section* 383 *(Agriculture). International, although special attention is given to Hungarian literature. This review has a supplement* Magyar nemzeti bibliográfia *(National Hungarian Bibliography),*

INDIA

Indian science abstracts (being an annotated bibliography of science in India). [Calcutta]. National institute of sciences, 1935—

Appears annually in two parts. Annotated bibliography covering Indian publications regarding the field of mathematical, physical and biological sciences. Classified according to subject. Subjects of agricultural interest are found chiefly in the botanical (Economic botany, Plant diseases), *zoological and chemical sections* (Agricultural chemistry).

ITALY

Bibliografia forestale italiana per l'anno 1936. Firenze, 1939— (Unione internazionale degli istituti di ricerche forestali. Italia. Milizia nazionale forestale. Regia stazione sperimentale di silvicoltura. Firenze).

Annual though at present suspended. Edited by E. Allegri. *Forms part of the* Bibliographia universalis silviculturae. *Title bibliography of Italian publications on forestry. Systematically arranged according to the Decimal Classification (Flury modification). The titles are printed on one side only to facilitate filing. Approximately 200 titles a year.*

Bibliografia giuridica internazionale. Roma, Edizione dell'Istituto italiano di studi legislativi, 1935—

Irregular. The first volume contains the literature for 1932. Title bibliography which plans to cover the juridical literature of all the countries of the world. Compiled by numerous collaborators in different countries. The classification adopted differs from one country to another. For some countries, for example, Italy and Belgium, agricultural law is treated separately, while for other countries, the subject matter of agricultural interest must be sought for in the different sections of the bibliography. The citations in lesser known languages are followed by a translation in one of the principal languages. A 'Systematic-analytic subject index in four languages' and an 'Alphabetical list of authors' names' are given at the end of each volume.

Bollettino della biblioteca. (Ministero dell'Agricoltura e delle Foreste). Roma, Istituto poligrafico dello Stato, 1912—

Appears irregularly at wide intervals. Reports in very detailed systematic order the new accessions of the library of the Ministry of Agriculture, which besides the different branches of agriculture, embraces economics and sociology, law, natural sciences, etc. The last number (issued in 1937 and regarding the period July, 1934 to June, 1936) contains over 3000 citations. Chiefly Italian publications. Continues the supplements of the Catalogo della Biblioteca (1889), *published from 1893 to 1912.*

Meteorologia pratica: rivista di meteorologia e scienze affini. Perugia, Facoltà di agraria della Regia Università, 1920—

Bimonthly. Contains Bibliografia meteorologica italiana dell'anno. *Title bibliography. Systematically arranged. Records articles and summaries in Italian, of original publications both Italian and foreign. A section treats on meteorology and agricultural ecology. Approximately 650 titles a year. Contains also, beginning from the 2nd number of the 4th year (1923) a very complete and retrospective bibliography on Italian meteorology. This bibliography arranged alphabetically according to author has now reached the letter M.*

Politica sociale. Roma, 1929—

Monthly. Contains under the title Notiziario bibliografico *a partial annotated list of new publications (books and contents of reviews and journals) on social problems including political economy. Under this latter heading, in particular, information of agricultural interest is to be found. International, although citations of Italian publications predominate.*

Rassegna di scritti economico agrari (Istituto nazionale di economia agraria). Roma, 1939—

Irregular. A journal of fairly long summaries of new publications (mostly books) on agricultural economics. About 15 abstracts in each number. International, though Italian publications predominate.

Rivista del catasto e dei servizi erariali. Roma, 1934— (Ministero delle Finanze).

Bimonthly. Contains two sections of bibliographical character, one of which gives rather detailed abstracts of periodical articles, while the other (Note bibliografiche) *contains book reviews. A certain number of the subjects treated are of direct or indirect interest as regards agriculture, for example land valuation, land tenure, land register, surveying and hydraulics.*

Rivista delle colonie; rassegna dei possedimenti italiani e stranieri d'oltremare. Roma, Casa editrice L. Cappelli, 1927—

Monthly. Published since January, 1940 with a monthly supplement Bollettino bibliografico coloniale, *edited* by S. Zanutto. *Title bibliography of all colonial problems, arranged according to subject and subdivided according to country. About 200 titles per issue. International, though the citations in the Italian language predominate.*

Saggio di bibliografia giuridico-agraria coloniale. Roma, Edizioni universitarie, 1940— (Osservatore italiano di diritto agrario).

The first number (1940) covers three years (1937-1939). Now annual. Compiled by S. Zanutto. *Title bibliography dealing fully with literature on colonial agricultural literature. Also records the most important publications on geography, ethnography and sociology of the hot countries of the old world. Arranged systematically and geographically;* A. Opere generali. B. Africa (in generale). C. Colonie e paesi sotto mandato. *Alphabetical list of authors.*

NETHERLANDS

Economische voorlichting; weekblad van den Economischen voorlichtingsdienst. s'Gravenhage, 1907— (Afdeeling Economische voorlichting der Directie van Handel en Nijverheid van het Department van Handel, Nijverheid en Scheepvaart) [Economic information; weekly journal of the Economic Information Bureau, Economic Information Bureau attached to the Board of Trade and Industry of the Department of Trade, Industry and Shipping].

Weekly. Contains an annexed supplement Literatuur-Documentatie, *which every week gives an annotated bibliographical list of the new publications treating on economic conditions and economic and social policy. Arranged according to the Decimal Classification. Citations in the Dutch and German languages predominate. Frequently contains references of agricultural interest.*

Tectona; Boschbouwkundig tijdschrift Uitgave der Vereeniging van hoogere ambtenaren bij het boschwezen in Ned. Oost Indië. Buitenzorg. — [Tectona; forestry journal. Published by the Association of the Senior Officers of the Forestry Administration of the Netherlands East Indies].

Monthly. Contains occasionally a Literatuur-overzicht *which consists of a synthetic abstract of a variable number of recent works regarding the different problems of tropical forestry. Also gives the contents of the other principal periodicals on tropical sylviculture.*

POLAND

Acta Vitaminologiae. Wilno, Zakład fizjologji zwierząt i nauki żywienia, 1938-1939.

Quarterly. Includes a section for abstracts of new works and a list of new publications, the latter accompanied by brief descriptive notes on the problems of vitaminology, hormones and allied subjects. Titles in original language, followed by a translation in Polish. Text in Polish. Also a list of the publications recently received by the editor. No longer published.

Gleba i nawożenie potasowe. Referaty prac, Poznań, Zakład gleboznawstwa U. P., 1937-1939. [The soil and the use of potassic fertilizers. Abstracts of publications].

Irregular. Contains signed abstracts of publications on soil science and the use of potassic fertilizers. Titles are given in the original language followed by a translation in Polish. Text in Polish. Annexed to the review Roczniki nauk rolniczych i leśnych. No longer published.

Rocznik ochrony roślin. wydawnictwo Działu ochrony roślin Państwowego instytutu naukowego gospodarstwa wiejskiego. Puławy, 1933-1939. [Plant Protection Yearbook. Publication of the Plant Protection Section of the State Agricultural Scientific Institute].

Irregular. Includes a section of signed abstracts of publications on plant protection. The titles given in the original language are followed by a translation in Polish. Text in Polish. Occasionally contains special bibliographical selections of certain specific questions. No longer published.

Spółdzielczy przegląd naukowy. [Warszawa], Spółdzielczy instytut naukowy, 1928-1939. [Scientific cooperation review].

Monthly. Annotated bibliography of Polish and foreign publications on co-operation. Also includes a section for signed abstracts and a list of the new accessions of the Institute. Although the review is devoted to cooperation in general many of the works abstracted regard agricultural cooperation. Polish publications predominate. Published from 1928 to 1931 under the title Biuletyny Spółdzielczego instytutu naukovwego. *No longer publirhed.*

Uprawa roślin i nawożnie; czasopismo poświęcone zagadnieniom naukowym produkcji roślinnej. Poznań, Zjednoczone fabryki związków azotowych w Mościcach i Chorzowie, 1929-1939. [Plant cultivation and fertilization; publication devoted to the scientific problems of plant production].

Bimonthly. From 1929 to 1934 published under the title Nawozy sztuczve, *In 1935, the bibliographical part was published as a separate issue under the title:* Roczniki nauk rolniczych i leśnych. Dodatek. *Suspended during the years 1936 and 1937, the publication was renewed in 1938 and ceased in 1939. Contains a section* Referaty *giving signed abstracts, arranged according to subject, of new works on physiology, chemistry, soil science, fertilizers, selection, fertilization of special crops, horticulture, plant diseases, experiments and other questions. Titles given in the original language followed by a translation in Polish. No longer published.*

SWEDEN

Kungl. Landbruks – akademiens tidskrift. (Annales de l'Académie royale d'agriculture de Suéde.) Stockholm, O. L. Svanbäcks Boktryckeri A-B., 1861—

Six times a year. Contains besides a section of signed, fairly long abstracts, since 1940 under the title Nyinkommen nordisk litteratur, *an annotated bibliography of agricultural publications of the Northern countries (Scandinavia and Finland) which is compiled by the Library of the Academy, and which is published irregularly. Classified according to country of publication. Irregular. About 150 citations per annum.*

Sociala meddelanden, utgiona av K. Socialstyrelsen. Stockholm, 1912— [Social communications, published by the Ministry of Social Problems].

Monthly. Contains, since 1926, under the title Tidskriftöversikt *a title bibliography covering social policy and sociology. Arranged alphabetically according to subject, subdivided according to country. Contains matter of agricultural interest. The review also contains an alphabetical list of the new accessions of the Library of the Ministry. International, though references to Scandinavian works predominate.*

SWITZERLAND

Schweizerische Bibliographie für Statistik und Volkswirtschaft. Bibliographie suisse de statistique et d'économie politique. Bearbeitet vom Eidgenössischen Statistischen Amt Bern. Bern, Schweizerische Gesellschaft für Statistik und Volkswirtschaft, 1937—

Annual. Title bibliography comprising all publications on statistics and political economy issued in Switzerland or concerning Switzerland. Arranged according to the Decimal Classification. Various sections are of direct interest as regards agricultural documentation. The bibliography is preceded by a bilingual (German-French) précis of the Decimal Classification.

UNITED KINGDOM

Bibliography of meteorological literature. London, Royal Meteorological Society, 1922—

Half-yearly. International title bibliography. Arranged according to the Decimal Classification. Subject-matter of agricultural interest, for example, in the section Soil moisture and hydrology.

Dairy science abstracts. Shinfield, Reading, 1939— (Imperial bureau of dairy research):

Quarterly. Replaces List of references from current literature (1928-1939). *Gives abstracts of all new works (books and articles) on the problems of dairy production and dairy products. Arranged systematically. Alphabetical list of authors in each number. Approximately 500 abstracts per issue. International, although publications in English predominate.*

Forestry abstracts. Oxford, Imperial Forestry Bureau, 1939—

Quarterly. The most important section of this publication is the Abstract Section, *containing abstracts of new works (periodical articles) treating on all branches of forestry. Book reviews are given in a separate section. Systematically arranged according to the Decimal Classification (Flury modification). International.*

Journal of the Textile Institute. Manchester, 1910.—

Monthly. Includes in each number a section, with separate paging, containing abstracts of new works (comprising patents) regarding the textile industry. Of special agricultural interest the first chapter: Fibres and their production. *International*

University of Cambridge. School of Agriculture. **Memoir** No. 1—A brief summary of the papers published by the Staffs of the School of agriculture and its associated research institutes. Cambridge, 1929—

Annual. Contains abstracts of the scientific papers of the functionaries of the School of Agriculture and associated institutes, covering all branches of agriculture. Classified according to subject. Alphabetical author and subject index.

Soils and fertilizers. Harpenden, 1938—(Imperial Bureau of soil science).

Bimonthly. Replaces Publications relating to Soil Science *(1931-1938). The most important part of this review is the* Abstract section *covering new scientific publications on soil science, plant nutrition and allied subjects. The abstracts are rather brief. Very detailed systematic arrangement according to the Decimal Classification. About 400 abstracts in each number. International.*

UNITED STATES OF AMERICA

Agricultural finance review; a semi-annual review of current developments and research in the field of farm credit, farm insurance and farm taxation. Washington, 1938— (U. S. Department of agriculture. Bureau of agricultural economics).

Half-yearly. Contains under the title Literature on agricultural finance *a bibliography partially annotated on farm credit, assessment, insurance, taxation and local administration. Compiled according to 'Agricultural economics literature' by the Library of the Bureau of Agricultural Economics. Approximately 250 titles per annum.*

Economic library list. (U. S. Department of agriculture. Bureau of agricultural economics). Washington, D. C. No. 1 (1939)—

Irregular. Mimeographed. This publication is not a current bibliography properly so called, but a series of bibliographical monographs, each referring to some particular subject on rural economics. The bibliographies are compiled by the members of the staff of the Library of the Bureau of Agricultural Economics. Frequently include annotations on the contents of the publication cited. Subjects of American interest predominate. Chiefly American sources are cited.

Handbook of Latin American studies: 1935— Cambridge, Mass., Harvard Univ. Press, 1936—

Editor: L. Hanke. *Bibliographical guide to scientific publications (works and articles) on Latin America in the field of sociology, historic and philological*

sciences. The titles cited are often accompanied by descriptive notes. Arranged according to main subjects, subdivision according to country. Material of agricultural interest is found chiefly in the chapter Economics, *and secondly in the chapters* Folklore, Geography, Law. *Key to abbreviations. Author index.*

Journal of the American Society of Agronomy. Geneva, N. Y., 1907—

Monthly. Contains in the December, 1933 number a title bibliography on standardization of field experiments, which is brought up to date by Additions *more or less annual. Arranged alphabetically according to author. International, although publications in English predominate.*

The Pan American book shelf. Washington, Pan American Union, Columbus Memorial Library, 1938—

Monthly. Partially annotated bibliography of general character based on the material received at the Columbus Memorial Library. *Refers to publications dealing with the countries of Latin America. Arranged under general headings, including* Agriculture, Economics, Science *and* Sociology *and* Social Sciences *which are of special interest. A separate author index is published at the end of each year.*

Rural Sociology; devoted to scientific study of rural life. University, Louisiana, State University Press, 1936—

Quarterly. Contains a section Current Bulletins *for abstracts of new publications issued by the Government and American research and instruction institutions. Another section* Book Reviews *treats on other publications and gives signed, rather long, abstracts. Predominate publications in the English language.*

Soil conservation literature; selected current references. Washington, Soil conservation service, 1937—

Bimonthly. Mimeographed. The most important part of this reference work is that devoted to Periodical articles. *The publications reported, to a large extent of American origin, are frequently accompanied by brief descriptive annotations. Arranged alphabetically according to subject. Other sections refer to separate works, official publications of the United States Government, soil surveys, etc.*

Tropical woods. New Haven, 1925— (Yale University. School of Forestry).

Quarterly. Contains a section Current Literature *with abstracts of new scientific publications regarding tropical forestry. General index every two years. 30-50 abstracts in each number. International.*

U. S. S. R.

Sovetskaja botanika. Moskva-Leningrad, Akademija nauk SSSR, 1933— [Soviet Union Botany].

Fortnightly. Contains a section of abstracts of publications relative to botany in general and to applied botany. The review also contains (1) under the title: Sovetskaja botaničeskaja literatura *an annual title bibliography of articles taken from*

Soviet periodicals of a botanical character, arranged systematically; (2) *under the heading:* Novye inostrannye knigi po botanike *an annual bibliographical list of new foreign publications with rather brief summaries;* (3) *under the title:* Inostrannaja botaničeskaja literatura po sistematike i geografii cvetkovyh rastenij *an annual title bibliography of foreign literature on the systematics and geography of phanerogams. Systematically arranged. Contains much material of agricultural interest.*

Vestnik zaštity-rastenij. Bulletin of plant protection. Leningrad, Selkhozgiz, 1939—(Vsesojuznaja akademija s.k. nauk im. V. I. Lenina).

Irregular. Continuation of the review: Zaštita rastenij. *Contains under the title:* Spisok literatury po zaštite rastenij ot vreditelej i boleznej *a title bibliography of articles in the Russian and foreign languages on phytopathology and plant protection. Arranged systematically. About 900 titles a year*

INTERNATIONAL INSTITUTIONS

Bibliographia forestalis; Bibliographie forestière du Centre international de Sylviculture. Berlin-Wannsee, 1942—

Annual. Prepared by the Bureau of the International Forestry Centre with the collaboration of the national organizations of numerous European countries pertaining to the International Union of Institutes for Forestry Research. International title bibliography of forestry in all its branches and aspects. Arranged according to subject in extensive groups which correspond to the classification adopted for the IIIrd part of the review Intersylva. *Each title is also followed by the index figure of the Decimal Classification (Flury modification). Titles of the lesser known languages are translated into one of the commonly spoken languages. The abbreviations of the names of journals conform to the International Index of Forestry Periodicals (Sylvae Orbis, I, 1940), published by the International Forestry Centre. The first volume contains over 3,000 titles. Alphabetical author index.*

Bibliographie internationale d'économie rurale. International bibliography of agricultural economics. Internationale Bibliographie der Agrarwirtschaft. Rome, 1938—(Institut International d'Agriculture).

Quarterly. Continuation of Internationale Bibliographie des agrarökonomischen Schrifttums *published from* 1932 *to* 1939 *in the* Berichte über Landwirtschaft *edited by the Ministry of Agriculture of the German Reich. Compiled at the Library of the International Institute of Agriculture by the courtesy of* S. v. Frauendorfer. *Title bibliography (publications and articles) of a strictly international character sometimes with explanatory notes. Covers the field of agricultural economics in all its branches. Arranged according to the* Classification scheme of agricultural science *(2nd edition, Rome, 1942), a summary of which figures in each number of the Bibliography. The titles of the publications in lesser known languages are followed by a translation in one of the principal European languages. At the end of*

each volume, alphabetical author and subject index. List of the abbreviations of the periodicals abstracted published as an annexe to the 4th number for the year 1942 (Vol. 4). About 5000 titles per annum.

Bulletin international de droit agricole. Rome, 1939—(Institut International d'Agriculture).

Half-yearly. Published also in German and in English under the titles: Internationale Zeitschrift für Agrarrecht *and* International bulletin of agricultural law. *Contains a section* Bibliography *which, on the one hand abstracts the articles of juridical reviews on agricultural law and on the other, examines the separate publications on the same subject. The abstracts are frequently fairly long. International.*

Chronica nicotiana; Zeitschrift der Internationalen Tabakwissenschaftlichen Gesellschaft. Bremen, Arthur Geist Verlag, 1940—[Sub-title in various languages].

Four times a year. The section Literatur *in the last numbers distributed among the different chapters of the journal contains, abstracts often rather long, of new publications and articles on the production, industry and consumption of tobacco. Also includes a list of patents. International.*

Intersylva; organ of the International Forestry Centre. Berlin-Wannsee, 1940—

Quarterly. Published also in German under the title Intersylva Zeitschrift der Internationalen Forstzentrale. *In the IIIrd part under the heading* Littérature forestière *(formerly* La science forestière) *an international selection of foreign publications, which is not complete, ' but gives very brief abstracts and sometimes only mentions the publications, those foreign publications which contain results of experiments and research work which are of interest for their importance from an international standpoint or for their novelty from the scientific viewpoint '. Classified according to subject. The titles of the works analyzed precede in each section a general review of variable length. Strictly international.*

Revue vétérinaire slave. Slavjanski veterinaren pregled. Przegląd weterynaryjny słowiański. Slovanská veterinařská revue. Slavenska veterinarska revija. Organe officiel de l'Union des vétérinaires slaves, fondée le 3 mai 1932. Sofia—Warszawa - Praha - Beograd, 1933-1938...

Irregular. Contains abstracts of works given in Slav publications on veterinary science and service as well as on animal husbandry, arranged according to subject. Titles in the original language and accompanied by detailed summaries in German, English and French. Approximately 24 Slav technical journals are reviewed. No longer published.

Le Tabac; organe trimestriel du ' Centre international du tabac ' (Fédération internationale des techniciens agronomes). Rome, 1938—

Quarterly. Contains a section Revue des revues *which gives a number of abstracts of new scientific works on physiology, cultivation, diseases and utilization of tobacco. The text of the abstracts is given in French but the summaries are repeated in German in the column* Zeitschriftenübersicht. *Approximately 100 abstracts a year. International.*

Alphabetical Subject Index

Alphabetical Title Index

PRESENT DAY ANIMAL NUTRITION PROBLEMS

FODDER CELLULOSE

Dr István Moskovits

To feed livestock during war-time, it is frequently necessary to turn to forages which, in normal periods, are not used at all or else only very little and which can serve as a substitute for those feedingstuffs lacking. Among these fodders often adopted today, particular importance should be given to fodder cellulose extracted from wood and which is already being employed to a large extent in animal feeding in the countries of North Europa.

I. — General

In consequence of the war, the forage supply of the countries of North and West Europe has become a particularly difficult problem. As is known the livestock density is so great that even in peace-time forage requirements were far from being covered by their production of cereals and fodders and that large quantities of these feedingstuffs had to be imported. The want of concentrated feeds caused through the war has consequently made itself heavily felt and also all the more so in that the last few forage harvests have not been very good. Similar problems arose in the 1914-18 war, but this time they seem to have become more acute and consequently influence animal production very appreciably. In these circumstances an endeavour is made to find a solution by producing supplementary supplies of forage and it understandable that, in view of the wealth of timber in these regions, the production of fodder cellulose has again become important today.

In the countries which, during the 1914-18 world war and during the first years following, suffered greatly from shortage of forage, the production and foddering of forage cellulose obtained from wood and straw had already been realized on a large scale.

The disproportion between the low nutritive value of wood and straw and that relatively high of some of their constituents soon led to making possible the absorption by the organism of these nutritive elements contained in these products by subjecting the raw material to a chemical or physical treatment (1) * The low food value of these highly lignified cellulose fodders depends not so much on their content of useful constituents as on the fact that these, being enveloped in encrusting substances require increased effort in mastication and digestion and that they are not or only slightly accessible to the stomach and intestinal bacteria. Experiments have shown that generally ordinary wood meal cannot be considered as a forage and that vigorous action is necessary in order to render, by means of chemico-physical disintegration, the nutritive elements contained utilizable for animal digestion. The bond connecting the nutritive elements, particularly cellulose, must be broken or at least loosened by dissolution and removal of the lignified parts. This end may be attained by treating chemically very lignified plants, with or without the use of heat or pressure. By this treatment, within a relatively short time, the bond which probably exists between the lignins and cellulose can be broken or the lignifying substances dissolved. In principle, this liberation of the cellulose is identical with the process of the paper-making industry to the extent in which it is a question of the separation or extraction of the pure cellulose from straw – straw cellulose – or wood. With this treatment, the food value of the cellulose increases proportionally to the removal of the incrusting substances.

Already in 1900, C. KELLNER (2) established by respiratory tests carried out with oxen that such a process may have a practical value from the standpoint of the technique of alimentation and proved that disincrusted straw or cellulose has almost the same calorific value and the same effective physiological power as starch.

TABLE I. — *Calorific value and effective physiological power per gram of digestible organic substance in calories.* (According to KELLNER)

Product treated	Calorific value	Effective physiological power
Starch	4,183 calories	3,760 calories
Disincrusted straw	4,247 ,,	3,651 ,,

Although, on the basis of the results cited by KELLNER, since the beginning of this century attention has been turned to the disintegration of straw and wood, its introduction into farm practice failed owing to the cost. It was only after LEHMANN carried out his experiments on the disintegration of straw during the world war that, under the impulse of the need of forage at that time, the tech-

* The figures in brackets are reference numbers; see pp. 419-420

nical processes were perfected and that an endeavour was made to utilize them practically (FINGERLING, SCHEUNERT, NECKMANN, COLSMANN, etc.). The improved technique of the different processes also contributed towards increasing profitableness. At the same time, an attempt was made to study, from the scientific viewpoint the phenomenon of the disintegration of straw and the modifications produced in regard to forage value. On the basis of the research work effected at the laboratories of the German War Committee for forage substitutes, MAGNUS considers that the salient point of the disintegration of straw lies in the fact that a raw material having 11 per cent. starch equivalent is transformed, with a yield of 55 per cent. into a 'feed straw' with 60 per cent. starch equivalent. In other words, from 100 kg. crude straw with 11 per cent. starch equivalent, $0.55 \times 60 = 33$ kg. starch equivalent is obtained, being equal to three times the fodder value of the straw. This result is attained by separating the indigestible lignin and the ash (incrustations) of the crude fibres, but is accompanied, however, by a certain destruction of the organic substance (cellulose, pentosans) possessing an effective digestible value. In judging the value of the different processes, the extent of yield is not the only important point; it is also necessary that the separation of the incrustations exceeds in percentage the destruction of the effective organic substance. The product obtained should also yield a healthy and appetizing forage; the process of transformation should be such that it consumes as little coal as possible and be rapid, namely, require little time.

While in Germany, most of the studies and research carried out during the war years 1914-18 and during the first years of the post-war period regarded the disintegration of straw, in the Scandinavian countries experiments were chiefly on wood.

From extensive studies—which, in part, were also effected in Germany on the digestibility and nutritive value of disintegrated wood meal (KELLNER, FINGERLING, ZUNTZ, ELLENBERGER, WAENTIG)—it follows, without any doubt, that the digestible crude fibre or cellulose of wood may be disintegrated, namely liberated by the use of various chemical products, that it is digestible to a high degree and possesses a considerable food value.

From the practical experience acquired at that time, it ensues that disintegration enables obtaining for ruminants and horses, a forage the value of which—according to temperature, pressure and concentration of the lixivium—may be compared with that of meadow hay, bran and even a true concentrate. On the other hand, owing to its nature, this forage is not suitable for feeding pigs. It should be noted, however, that only cereal straw is suitable for disintegration, not that of colza and rape. As regards legume hay and straw, the inevitable loss in protein involves an appreciable reduction in quality. In the case of woods, those with a large percentage of heart-wood were not equally as good for fodder production.

As regards the technical realization of disintegration, it seems that the processes now applied—even though they have been improved in some particular—are similar in principle to the methods formerly used.

During the first world war, very good results were obtained in the disintegration of straw with the use of caustic soda, quicklime and sodium carbonate, while experiments with dilute hydrochloric acid gave negative results.

Among the different processes developed at that time for the disintegration of straw, particular mention should be made of the so called BECKMANN process in which the lignin is separated by letting a solution of caustic soda take effect on straw placed in a wooden receptacle having the inner walls protected by a coating of tar and without using heat. This process was valuable chiefly because it economized fuel and because its simplicity enabled it to be adopted on the farm: with some modifications, it is still employed for these reasons in Norway (7).

In the disintegration of wood, the same as in paper-making, the cellulose is extracted by the sulphite process (sulphite cellulose), by the sulphate process (sulphate cellulose) or also by the soda process (soda cellulose). It seems that the sulphite process is the most important and most common; according to HVIDSTEN, the quantity of cellulose produced with the sulphite process and that from the sulphate process are in the ratio of 7 to 1 in Norway.

The same author considers that the different forage celluloses present but little difference as regards their chemical composition. The lignin content depends on the varying degree of heating. With the sulphite process, the cellulose contains 1 to 5 per cent. lignin, with a yield of 45 per cent. Using a lower degree of heat, the yield is 50 per cent. and the lignin content 2 to 4 per cent. The disintegrated straw, accoring to its chemical composition, differs rather from pure cellulose produced industrially; it contains more ash, more ether extract, crude protein and N-free extractive. Here also the composition varies according to the more or less marked degree of cooking or digesting, etc.

II. — Digestibility and nutritive value

As has already been pointed out, pure wood-meal or flour, not treated, is not a food. Different experiments have proved that it is not utilized by any species of animal. Recent investigations carried out by GIUSTI (4) on fowls gave the same results.

It has also been found some time ago that the fermentation of wood meal or a mixture of wood meal with other appetizing foods of high nutritive value—such as distillery vinasse or potato residue—does not augment digestibility either. It has even been established that the use of wood meal as fodder has an unfavourable influence on the digestibility of the basic ration. The experiments of KIRSCH and JANTZON (6) on the whole give the same result. For their research work they manufactured a forage by ensilaging beech or pine sawdust and bringing about fermentation by means of sugar or beet leaves. In the case of sawdust of softwood (pine), a slight improvement in the digestibility of the crude cellulose is observed, but this advantage is too small to enable the economic use of the process. LEHMANN, on the contrary, demonstrated since 1894 that if, by a physicochemical means, the cellulose can be separated from the incrustant matter, it is possible to increase the digestibility of the lignified substances. Thus, after

cooking in Papin's digester with a 4 per cent. caustic soda solution, he succeeded in obtaining the following increases in the digestibility of the products treated:

TABLE II. — *Increase in digestibility by disintegration.*

Product treated	Dry matter	Crude cellulose
Oats straw	from 37 to 63 %	from 42 to 72 %
Wheat husks	„ 26 to 56 %	„ 37 to 83 %

O. KELLNER, who also carried out similar experiments, used a 'feed straw' obtained by treating rye straw. Digestibility amounted to 95 per cent., while only 30 to 40 per cent. of the non-treated straw was digested. The digestibility values of disintegrated straw or wood were more frequently determined subsequently and the improvement in the processes was shown in the higher digestibility figures of the products obtained. The results of different investigations effected are assembled in Table III.

TABLE III. — *Digestibility value of disintegrated straw or wood according to the results of tests carried out on animals.*

Type of cellulose	Investigator	Year of research	Type of animal	Digestibility in %	
				organic matter	crude cellulose
Soda Cellulose No 1	Fingerling (2)	1919	Sheep	76.94	88.68
„ „ „ 2	—	—	—	91.33	97.54
Sulphite cellulose „ 3	—	—	—	76.83	91.32
„ „ „ 4	—	—	—	74.63	92.62
„ „ „ 5	—	—	—	89.95	96.03
„ „ „ 6	—	—	—	84.14	89.23
Pure cellulose	Liebscher (2)	1940	Sheep No. 2	85.2	94.6
„ „	»	—	» No. 2	81.8	92.9
Cellulose waste (with 11.4 per cent. lignin)	»	—	—	74.4	75.4
Sulphite wood cellulose . . .	Ellenberger and Waentig (3)	1917	Horse No. 1	—	(a) 78.59
„ „ „ . . .	—	—	» No. 2	—	(a) 83.18
„ „ „ . . .	—	1917	» No. 3	—	(a) 87.15
Soda cellulose from spruce-fir	»	1917	»	—	(b) 87.89
Soda cellulose from Norway pine	»	1917	»	—	(b) 83.87
Pure cellulose	Edin (2)	—	»	85.90	—
Straw cellulose	Fingerling	1919	Pig	88.85	(c) 94.81
„ „	»	1919	»	—	(d) 97.27

(*a*) 3/4 kg. given per animal per day. (*b*) Per animal per day: 1.125 kg. plus 3 kg. oats and 1.5 kg. hay — (*c*) 600 gm. of moist 'feed straw' containing 92.3 gm. dry substance given per animal per day. — (*d*) 2000 gm. feed straw containing 288 gm. dry substance (utilization value in this experiment of a gram of cellulose: 2,535 calories; 1 gm. potato starch, 3,369 calories).

Table IV is taken from a work of HVIDSTEN (7); it also contains the results of tests for the determination of digestibility of ruminants, results which are grouped in accordance with the disintegration process.

TABLE IV. — *Results of the determination of digestibility in ruminants.* (*According to* HVIDSTEN [7]).

Number of tests	Organic matter	N-free extractive	Fibre	N-free extractive and fibre	Lignin	Investigators
(*A*) SULPHITE CELLULOSE						
2	86.6	70.5	93.4	—	—	Edin 1918
						Isaachsen-Høie.
2	91.3	89.7	95.5	95.1	—	Bang-Sandmo, 1918
2	78.8	26.1	90.8	85.0	—	» »
2	91.0	62.0	100.0	96.0	—	Hvidsten, 1940
6	87.7	70.0	96.0	93.0	—	» »
1	86.0	67.0	94.0	90.0	—	» »
2	82.0	64.0	90.0	87.0	—	» »
2	86.0	45.0	94.0	89.0	68.9	» »
2	75.0	61.0	82.0	80.0	28.0	» »
2	76.0	—	92.0	82.0	61.6	» »
2	77.0	64.0	84.0	81.0	22.4	» »
(*B*) SULPHATE CELLULOSE						
3	88.4	63.3	95.8	—	—	Edin, 1918
2	83.0	—	98.0	88.0	13.6	Hvidsten, 1940
1	83.0	42.0	92.0	85.0	—	» »
(*C*) STRAW CELLULOSE						
4	71.2	60.5	80.9	—	—	Fingerling, 1918-19
2	61.1	51.0	71.0	—	—	» »
1	46.3	32.9	54.9	—	—	» »
1	72.8	79.6	80.4	—	—	Fingerling, 1917
2	70.3	57.3	79.8	—	—	» »
2	59.3	48.1	69.2	—	—	» »
1	45.7	40.2	58.0	—	—	» »
1	62.0	46.0	78.0	66.0	—	Hvidsten, 1940

Experiments of FINGERLING have already proved that wood cellulose from lignifying substances is as digestible as straw cellulose freed from incrustant matter and, that from this standpoint, there is no essential difference between the soda or sulphite treatment. The data given in Table 4 strengthen this statement and show that the digestibility of the cellulose obtained according to different processes do not present any appreciable variation. The organic matter is digested to the extent of about 75-90 per cent. and crude cellulose even more so.

The fodder cellulose obtained by the disintegration of straw or wood thus furnishes a feed which is well digested by ruminants and horses. Experiments of EDIN in 1940, as also practical feeding tests in general, show that it is not utilized well by pigs, which is explained by the fact that, in the case of ruminants and horses, besides the enzymic digestion, there also takes place, on a large scale, a

bacterial digestion which particularly affects cellulose. With the pig, however, digestion is principally enzymatic. The conditions for assimilation of cellulose exist therefore to a lesser extent. SCHMIDT and KLIESCH (2) explain the relatively high digestibility values established for the pig (see Table III) by the small quantity of 'feed straw' administered and are of the opinion that further attempts should be made to ascertain whether larger quantities of cellulose, such as should be considered for practical use as feed, would be digested and utilized in the same way.

The Institute of Physiology of the Higher School of Veterinary Medicine at Hanover (8) has, in recent times, dealt specially with cellulose digestibility in the case of the pig. The results indicate that some types of crude fibres are dissolved in the digestive apparatus of the pig, but the digestion of wood fibre, even after passing through the entire colon, is not probable.

As regards the digestion of cellulose by poultry, it seems that this question has not yet been sufficiently cleared up scientifically, but in any case, it is very little. KATAYAMA even established that poultry cannot digest it at all.

Numerous statements have been made on the forage value of disintegrated wood and straw. They show that there are some differences according to basic material and method employed (concentration of the lixivium, pressure, temperature), but prove that the food value is increased appreciably by the process of disintegration. This is clearly seen from the data given in Table V and collected by HONCAMP and his co-workers (1) on treating different kinds of straw with a 4 per cent. solution of caustic soda, under a pressure of 4 to 6 atmospheres.

TABLE V. — *Starch equivalent of different types of straw in kg. per 100 kg. dry matter.*

Type of straw	Starch equivalent		
	Crude straw	Disintegrated straw	Increase through disintegration
Barley	19.8	55.2	35 4
Oats	17.5	62.3	44.8
Rye	8.4	57.7	49.3
Peas	16.2	36.1	19.9
Colza	5.5	28.3	33.8
Rape	2.2	27.3	29.5

According to the investigator, the increase in starch equivalent is particularly high in the case of cereal straw, less for that of cruciferous plants and relatively the least for legume straw. BICKEL (1) states that, in experiments carried out at Upsala (Sweden), HELLEDAY estimates at 76 fodder units the food value for horses of 100 kg. of dry substance of fodder cellulose extracted from straw (the type of straw is not specified by Bickel, but the non-treated forage contained approximately 20 to 30 fodder units per 100 kg. dry matter); for fattening

steers, 21 fodder units were calculated per 100 kg. wheat straw, and after treatment, the value increased to 60 fodder units.

The nutritive value of cellulose produced from wood is indicated as follows by HVIDSTEN (7): (1) for horses: 1 unit = 1.25 kg. finely ground forage cellulose, with a dry substance content of 90 per cent. (namely that 100 kg. of this cellulose = 80 F. U. or 88 F. U. per 100 kg. dry matter); (2) for large livestock, 1 F. U. corresponds to 1.2 to 1.25 kg. fodder cellulose (that is to say, 100 kg. fodder cellulose = 83.3 F. U.).

EDIN (cited by SCHMIDT) gives as food value of pure cellulose for horses 80 F. U. (56 per cent. starch equivalent); further new sources (11) 79 F. U. The figures therefore, agree closely.

According to HVIDSTEN, the alimentary value of fodder cellulose for pigs would only be 70 per cent. of that determined for large livestock, even if it is supposed that it is digested just as well as by the latter. For the pig, therefore, 1.7 kg. fodder cellulose with 90 per cent. dry matter should be calculated for each fodder unit.

The albumin as also the vitamin content is zero. It is even frequently recognized that a supplement of albumin would be necessary to cover the protein expenditure of the work of digestion. In experiments on goats (1918) EDIN found that a supplement of 29 gm. digestible albumin per kg. of dry matter in the fodder cellulose was necessary. In experiments on sheep carried out at the Higher School of Agriculture of Norway, it was demonstrated that 45 gm. albumin had to be added to every kg. dry matter of fodder cellulose. In practice, in animal feeding, this point should naturally be taken into account and the remainder of the ration should contain an adequate quantity of albumin. By the addition of suitable food substances (fish meal, soybean flour, alimentary yeast) an endeavour is made by the stockfeed trade to facilitate the digestion of fodder cellulose. In the Scandinavian countries, the food value of these commercial mixtures is estimated at 84 F. U. (11).

III. — Technique and practice of feeding

The condition of and manner in which fodder cellulose is presented plays an essential part in obtaining successful results. Contrary to the previous world war, today wood is chiefly employed as the basic material, and the fodder cellulose is, for the greater part, manufactured industrially; the disintegration of straw at the farm itself does not seem to be practised much.

Forage cellulose should be given to animals in a form which makes it easily consumed, willingly and in adequate quantity. In this respect, the different animal species have different requirements, particularly as regards degree of fineness. The experiments of ISAACHSEN-HØIE (11) showed that fodder cellulose can be given to large livestock in the form of large leaves provided that they are first softened by soaking. Recent experiments have given the same results as those carried out during the first world war, namely that large livestock and sheep can be maintained quite well by feeding cellulose in the form of large leaves (softened). On

the other hand, it is absolutely indispensable that for horses the cellulose should be broken up. Horses grind their forage much better than ruminants and cannot swallow such large pieces. Cellulose fodder broken up small was also given to cows and it was found that the food value was somewhat increased; the experiments of ISAACHSEN in 1916 indicated 16 per cent. It is doubtful, however, whether the work of breaking up the cellulose is compensated by this increase.

Formerly, fodder cellulose was supplied in the form of moist or dry pulp. The moist pulp was dried in the air, then crumbled by hand and finally ground. Grinding is not easy and should be effected by means of special machines. From pulp rent by machine or coarsely ground, a very voluminous mass is obtained, similar to tow or wadding which not only increases the expenses for packing and transport, but also is not accepted willingly by stock and only in a small quantity. According to EDIN, the fodder cellulose should be in pieces the size of a small coin and even smaller if possible.

In different farms, threshers, chaff cutters and other machines of this type are used for breaking up fodder cellulose. With these expedients, evidently, good results cannot be obtained and, for this reason, an endeavour has been made to see to this work in the factory, the more so as already the fodder cellulose is frequently mixed with supplementary feedingstuffs.

In Germany, for example, the consumer only obtains the fodder cellulose finely divided and mixed as a constituent of a compound food. Care is taken that this compound preparation contains the necessary quantity of digestible albumin, vitamins and mineral substances, so that as an adequate feedingstuff it can be guaranteed absolutely.

Different methods of division are used in industrial manufacture. According to SCHMIDT, in Sweden a fodder celllulose obtained by cutting the sheets into small strips about 2 cm. long and 2 mm. wide is sold; in this form it is also suitable for horses. HVIDSTEN states that the machines utilized in Sweden cut the cellulose into small pieces which correspond approximately to the size of a grain of oats. A similar effect is obtained with the Norwegian Blysted machine. The HERBST process gives a cellulose flour similar to semolina which has no resemblance to cottonwool and which has given good results in Germany in the feeding of horses.

LIEBSCHER breaks up and crushes the moist cellullose which is subsequently dried. The product obtained resembles dry pulp; it looses the woolly aspect and would also appear to give good results. This process is easy to adopt and the resultant forage is cheaper than when obtained by the HERBST method.

Proper fragmentation has a considerable influence on the desire to eat and the absorption capacity of animals. SCHMIDT and KLIESCH were only able to get horses to eat 1 kg. per day of cellulose pulp split up according to the old methods. ELLENBERGER and WAENTIG in their time obtained similar results. With the cellulose meal of HERBST, however, it was possible to give in a feed mixture of 7 or 8 kg. per animal per day, 30 to 50 per cent. cellulose, without disadvantage to the horses and their work output. The cellulose fodder manufactured by LIEBSCHER, crushed, additioned with molasses and dried was well accepted by steers for fattening, the daily ration being 4.3 kg. per animal.

In one experiment horses were given 3 kg., and in another, 4 kg. They effected very heavy work and behaved quite normally; the forage was consumed willingly and well supported admixed with other feedingstuffs. In the absence of chopped straw and by reducing the ration of hay and oats, the amount of cellulose meal may be increased slightly still further.

Feed tests on pigs, in general, have not been successful; they do not consume the forage willingly and have difficulty in swallowing it. This aliment is even less suitable for poultry and for carnivora (fur-bearing animals).

PROFITABLENESS OF PRODUCTION AND USE

Although in exceptional periods an importance different from that in normal times should be attributed to the question of profitableness, nevertheless, it may be of interest to touch on the subject. It is true that there is very little information available on the question. This is particularly true as regards the industrial production of fodder cellulose Several of the reports at our disposition indicate that its production is just as expensive as that of ordinary cellulose, also the cost of drying the moist product, fragmentation, etc. must be added. The fact is also stressed that, in the countries of North Europe, the manufacture of forage cellulose is not a question of raw material, but solely of cost; in this respect it should be taken into consideration that the farmers cannot afford excessively high prices; they should always remain within the limits of the prices paid for agricultural products. The reason for industry having undertaken on a fairly large scale the manufacture of a product which apparently is of no particular importance to it, can be explained by the sales difficulties of many factories formerly operating for the export trade. The production of fodder cellulose at least keeps them running.

The consumption of chemical products and fuel would play an important part in the profitableness of different processes. As has already been pointed out, a higher temperature during manufacture makes for a greater elimination of lignin, but, at the same time, the loss in substance is higher. The most rational method is justly that with which the largest possible number of fodder units are produced at the relatively lowest price. It is thus, for example, that sulphite cellulose, the most employed, contains about 1 to 1.5 per cent. lignin; the yield, with this type, is approximately 45 per cent. wood. As digestibility tests have shown, the product obtained is well digested and in practical feeding tests the results are good. Forage cellulose with approximately 6 per cent. lignin produced at a lower temperature has a much poorer digestibility and may even occasion digestive disorders. Another type of cellulose, obtained with a low expenditure of heat, contains 2.6 per cent. lignin and yield is as much as 50 per cent. The importance of the correct determination of temperature is evident from the fact that for the production of 100,000 tons of fodder cellulose, an economy of approximately 44,000 m³ of wood may be effected, the cellulose manufactured being just as suitable for alimentation.

Naturally the c o s t o f p r o d u c t i o n varies rather considerably and the numerical data on this question have only a very limited value which at the most may only serve with a view to grasping the general position. The following

data for 1941 which give the production costs in different countries, therefore, should be treated in this light. In Finland, approximately 2.45 Fmk. per kg. were indicated as cost of manufacture; this figure dropped to 1.60 Fmk. when alcohol was also produced. The retail price amounted to 1.90 Fmk. A subsequent increase in production (from 600 to 8-900 tons per working day) enabled the cost to be brought to 1.75 Fmk. In Sweden, the manufacturing price was 18 öre; by increasing production, it was possible to reduce the price to 10 öre. With the most commonly used methods, for each ton of cellulose 150 litres of alcohol are also produced, the price of which is calculated at 112 öre per litre. The returns for the producer are 268 crowns per ton of cellulose. As well as sulphite cellulose, sulphate cellulose can also be manufactured, thus enabling an economy of 50 crowns per ton.

The following details are found in press reports on the extent of production in different countries. In Finland, there are 14 to 15 factories engaged in the manufacture of cellulose; as has already been noted, the production per working day should be increased from 600 to 8-900 tons per day. In view of the heavy demand, it seems that the Distribution Bureau of the State in Norway increased its contracts from 100,000 to 150,000 tons during the first semester of 1941. The annual anticipated production of 200,000 tons fodder cellulose is far from covering requirements. Of Sweden it was reported that the administrative services of the army had placed large orders; in 1941, the manufacture of 200,000 to 225,000 tons was anticipated, to which would have to be added approximately 50,000 tons remaining over from the previous season. It was not possible to sell this latter quantity the previous year as the price was found too high. According to another note in the 'Neuen Zürcher Zeitung' of April 27, 1942, at first, for 1941, the manufacture of 400,000 tons of sulphite cellulose was anticipated, but, in reality, only 280,000 tons were produced, to which had still to be added 135,000 tons sulphate cellulose. Sales to farmers from June, 1941 to the end of February, 1942 amounted to a total of 280,000 tons, so that by virtue of the old agreement, 135,000 tons, had still to be delivered. According to a new agreement between the Government and manufacturers, a further 100,000 tons sulphite cellulose will come to be added before May 1, 1942 and 35,000 tons sulphate cellulose before March 1, 1942. In Germany, as stated in the periodical 'Deutsche Kaltblut' (April 15, 1941), the *Zellmehl G. m. b. H. Berlin* will produce, in two factories, a forage of this type which has been given the name of 'Zellmehl'. The manufacture of this feedingstuff is based on soda cellulose according to a special process introduced from Scandinavia. By the treatment, the forage meal, which will serve for the preparation of a compound food for horses, gains in digestibility.

How does the question of profitableness regarded from the viewpoint of the consumer present itself?

Experiments made during the first world war already showed, as animal feeding practice now also proves, that fodder cellulose can be utilized to a large extent by animals whose digestive apparatus can turn to account forages with a high crude fibre content, namely ruminants and horses. In its use, naturally

allowance must be made for the want of albumin, vitamins and mineral substances, which must be supplied in sufficient quantity in the balance of the ration. In the case of albumin deficiency, fodder cellulose will be most frequently employed for uses which require the least quantities of albumin. It should be verified, however, whether, with forages produced on the farm, fodder cellulose is not partially or entirely superfluous, seeing that it can only be foddered in large quantities there where little other bulky feedingstuffs are distributed.

Despite its advantages, forage cellulose declined in use towards the end of the previous war and during the post-war years and that despite the persistent demand for forage; this fact may be attributed to the shortage of chemical products and the increasing difficulty in finding labour. The workmen available frequently refused to undertake the work, not exactly pleasant, for which special clothing was necessary to protect the feet and legs. Moreover, the disintegration of the straw on the farm itself – owing to the transport costs of the very bulky straw and the weight of the moist finished product, it is only in very special instances that disintegration of the straw takes place outside the farm – should be carried out very carefully, inadequate washing of the disintegrated straw having occasioned, in not a few cases, poisoning, frequently with fatal results. A preliminary condition for the realization of straw disintegration on the farm is an adequate water supply and the possibility of evacuating the waste water. On the other hand, this disintegration, as also the use of fodder cellulose, permits reduction in the areas reserved for oats and other forage crops.

After the decline in the manufacture and the use of fodder cellulose towards the end of world war, the product disappeared almost entirely when the well known feedingstuffs could again be procured. Only the forage shortage brought about through the present war has given it a fresh impetus and has caused foddering with cellulose to be renewed on a large scale. It still remains to be seen, however, whether the process will be able to be adapted definitively in agricultural practice and whether the recent improvements made in manufacturing methods will make it possible to lower the price to an extent that it also will no longer constitute an obstacle. Consequently it cannot yet be said whether, in normal times and in competition with well known feedingstuffs, cellulose will succeed in maintaining the position it has now conquered.

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MISCELLANEOUS INFORMATION

On a method for the study of the mineral intake of plants. Estimation of soil reserves

M. R. CHAMINADE of the National School of Horticulture at Versailles has described in a thesis a physiological method for the study of the soil which consists in exhausting forcibly this medium by growing a large number of barley seed (10) of the Kenya variety in a very limited quantity of soil (200 gm.).

The elements indispensable for the development of the plant are added to the soil in such a form as to prevent any phenomenon of toxicity. For this purpose, a small quantity of substance of high absorbent capacity is also added to the soil. By studying the reaction of the soil to the different nutrients, the extent of its reserves in these elements can be calculated. The experiment realized with sand devoid of nutritive elements makes it possible to determine the quantities of each element necessary for the growth of the plant. The method is applicable not only to the elements useful in large quantities, but also to the oligo-elements and has the advantage of reducing to a considerable extent the volume of the nutritive medium in which the plant grows and consequently of lessening the causes of the errors due to the impurities brought by the medium. In the 'Annales Agronomiques' of Paris (April-June, 1942) the author after the introduction, expounds: (1) the experiments carried out in 1940-41 (2); the results obtained in experiments with increasing doses of plant nutrients; (3) evolution of the optimum quantities of the different elements to be given to the plant: (*a*) in the case of nitrogen; (*b*) phosphoric acid; (*c*) potash; (*d*) manganese.

The experiments were carried out in series of four pots each containing 200 gm. sand together with the addition of the mineral elements necessary for the growth of the plant (10 barley plants). In one of the series, to the sand had been added 50 gm.

loam with a high exchange capacity (26.5 m. equivalents per 100 grams, $CaCo_3$' 36.7 per cent.). This addition of loam increased to an appreciable extent the yield in media devoid of all the elements necessary for growth. After many experiments, the author established the following basic fertilizer formula (gm. per pot.):

Nitrogen: 0.8 gm. $(NH_4)NO_3$ with 35 per cent. N;
Phosphoric acid: 0.5 gm. dicalcium phosphate with 40 per cent. P_2O_5;
Potash: 0.4 gm. potassium bicarbonate with 50 per cent. K_2O;
Magnesium: 0.3 gm. magnesium carbonate, 47 per cent. MgO;
Sulphur: 0.4 gm. calcium sulphate, 19 per cent. S.

To the medium are added the oligo-elements in the following forms and quantities:
Boric acid 2 mgm; sodium fluoride 2 mgm; sodium arsenate 5 mgm; sodium iodide 1.5 mgm; manganese sulphate 5 mgm; copper sulphate 1.5 mgm.; zinc sulphate 4.5 mgm.; aluminium sulphate 1.2 mgm.; iron tartrate 5 mgm.

The medium is moistened with rain or distilled water to the extent of 80 per cent. of its maximum water holding capacity. The plants after fructification and when they have attained their full development are removed from the earth, washed, air-dried and weighed.

This method which has given interesting results, is still as yet subject to experimental errors; the weights of the yields of the pots of the same series do not always agree. With further research and study, these errors can be reduced.

G. S.

The development of the Java sugar industry in recent years before Japanese occupation

The part played by the Java sugar industry in world sugar production as well as its importance in the employment of the abundant manual labour available in the over-populated island of Java is well known. It is known that thanks to an organized collaboration between the experiment station and the planters of a high standard, the yield per hectare has attained an incomparable level. The research work of scientists and the application of new methods continued after the economic depression of 1930 and subsequent years. The directors of the sugar industry, however, opposed giving publicity to the progress accomplished in maintaining their world monopoly particularly in regard to the new varieties created at the experiment station. Information is thus wanting and this lacuna has been evident in the recent volumes of our Bibliography of Tropical Agriculture.

We are all the more grateful to the Director of the Experiment Station at Pasuruan, Dr P. Honig, for having recently furnished, in one of the latest numbers of the International Sugar Journal, a brief but most interesting comprehensive article from which we have taken the following information. *

* * *

After the formidable downfall during the crisis years of 1931-1936, the Java sugar production re-stabilized itself during 1937 to 1941 ; the annual production steadied at a level of approximately 1,500,000 tons, figure which corresponds to half of the pre-crisis

* See Dr P. Honig. The Java sugar industry. Developments of recent years, *The International Sugar Journal*, London, 1942, Vol. XLIV, No. 524, pp. 206-208.

production. It is chiefly by reducing the number of working mills that the forcibly imposed diminution in production has been attained. (It may be noted for those readers who are unaware of the fact that at Java, each factory has its own cane grown in a district where it possesses the right to lease a fixed number of fields belonging to the native population. A reduction in number of mills, therefore, also signifies a reduction in area planted to cane).

The 184 factories before the crisis were reduced to 80 or only 43 per cent. The installations of a large number of factories were bought by sugar companies in British India, country where the Government, owing to its customs policy, had given impetus to a considerable extension in sugarcane planting. At Java, however, some 40 non-working mills have been maintained so as to be able to continue sugar manufacture when the world demand will allow of a further extension in the area under sugarcane.

This reduction in number of mills had two results: (1) the increase in capacity of each mill; an average daily crushing rate of 2000 tons has been attained; (2) the re-arrangement, where necessary, of cane areas so that the factory is situated in the centre of the area thus reducing cost of transporting the cane.

The reduction in the European staff of the sugar mills was considerable. Before the depression, the Java sugar industry had in its service 6000 European employees. After a first reduction to 800 men, the staff was subsequently increased and stood at 1600 before the Japanese invasion, of whom 800 were connected with the manufacturing process and 500 with the agricultural side of the industry. The same restriction applied to the scientific staff of the experiment station, but proved ineffectual and consequently the staff was increased and in 1941 numbered about 50 between agricultural engineers, chemists, entomologists and botanists.

The diminution in the area cultivated to sugarcane made it possible to enforce a vigorous selection and to cultivate sugarcane only on the soils most suitable for this crop. An average yield of 6.88 tons per acre, formerly unheard of, was thus attained. The author attributes this result to two factors: (1) selection of the most fertile and most easily irrigable fields; (2) careful selection of the varieties best adapted to the local soil conditions. It appears, after numerous attempts, that it has been possible to establish a relatively simple soil classification according to heaviness and colour, from which not only the varieties most suitable for a given soil may be ascertained, but also the best methods of manuring.

* * *

The sugar sales organization has been improved; a central selling body indicates to the mills the quota for the different types of grain, as well as the adequate distribution of the quantities for export and those for local consumption.

The experiment station, besides its other functions, has been called on to exercize general control of the quality of the sugar (grain size and regularity, whiteness, and impurities for which maxima are fixed.

* * *

The 1931-36 crisis and the 1939 war brought to the Java industry a number of new problems. One of these problems was packing material, namely, the jute sacks usually imported from British India. It is to replace jute fibre that the experiments, already begun some time ago, on the extensive cultivation of Rosella or Java jute, a Hibiscus variety, were energetically continued. The sugar mills themselves now grow this fibre plant and have also installed textile machinery for the manufacture of sugar bags. The result is that, even with the lowest quotation for Bengal jute on the Calcutta market,

these bags can now be made in Java at a competitive price. Moreover the quality of the bags is superior to that of the Indian jute sacks. The area under Rosella amounted to 5,000 hectares in 1941 ; it was intended to increase this area within the next three years to at least 10,000 hectares.

* * *

The economic use of molasses was the object of much study. A mill started making potassium sulphate by burning the molasses. The process comprises burning the molasses and converting the ash by finely powdered gypsum in suspension to sulphate of potassium. This use of molasses, however, was only conceived as a temporary measure and will be discontinued when mineral fertilizers can again be imported from Europe. The salt thus obtained is used in tobacco plantations where only pure sulphates can be employed, as the effect of traces of chlorides on the quality of the tobacco leaf is detrimental.

Another potash fertilizer is obtained by burning the molasses in combination with bagasse under the boilers. In this case, the potassium is present in the ash partly in water-soluble form, partly in an insoluble one, combined with silicates. Field experiments have shown that this ash is an excellent fertilizer.

A test plant began experiments on the use of molasses for the manufacture of food yeast. Experiments have shown that the addition of 5 to 15 grams of dried protein to the daily rate of food is sufficient to eliminate almost all signs of malnutrition observed in the native population, and it is proposed to remedy this deficiency by distributing yeast preparations. A plant was designed to produce 100 kilograms of dried yeast per day. It was a question of studying the best means for propagating and manufacturing yeast at a price which would compete favourably with other sources of protein, such as dried fish. The results of these experiments have given every satisfaction and the product can now be prepared in a form acceptable to the native population. Manufacture on a large scale was anticipated but the war put an end to all further work on the question.

The use of gas produced with bagasse for burning limestone is another interesting war problem. It was found possible, in fact, to reduce considerably the cost of the carbonatation process by using a producer working with wood or wood charcoal and, in particular, bagasse or bagasse charcoal, the latter being the cheapest fuels.

* * *

A greater part of the 1941 crop was exported than was expected ; ships with war material for the South Pacific took on sugar for their return voyage. A crop of 1,600,000 tons was expected in 1942, but military operations interfered seriously with harvesting. The latest news received in June, 1942 announces that harvesting began six to seven weeks later than usual.

The planting scheme for 1942 which would supply the 1943 crop was already under discussion in December, 1941. For 1943, a crop of approximately 1,700,000 tons was contemplated, so that after the war there would be a sufficient stock of sugar not only for trade requirements but also for relieving famished countries by furnishing them with one of the most valuable food commodities.

* * *

The arrangements for planting were seriously upset by the Japanese invasion. The future of Java sugar remains uncertain. The imprisonment of the European staff employees who were in military service will cause a reduction in the area planted

to cane. It should also be taken into account that the sugar production of the countries occupied by Japan is in excess of the consumption in Eastern Asia. Japan, Manchuria, China, Formosa, the Philippines, Indochina, Thailand and Java produce approximately five million tons of sugar while their consumption fluctuates between three and three and a half million tons. If the Japanese have no need to produce for reserve stocks, or if they do not consider exporting in the near future, they will necessarily have to consider reducing the area under sugarcane, but it is not clear how this reduction will be effected and how the restriction will be divided among the different occupied countries.

As regards the direct consequences of the invasion, the author writes as follows: (1) It is very probable that all the sugar stored in the go-downs at the ports ready for export has been burnt; this amounted to about 400,000 tons. (2) All the sugar bags ready for the coming crop have been systematically burnt. The difficulties of transporting the next crop will be considerable owing to the complete lack of packing material. (3) All the workshops and machine tools at the sugar factories have been demolished or transferred elsewhere.

W. B.

Use of sugarbeet leaves and crowns in human nutrition

Dr. HÜNERSDORF, in two articles ('Zuckerrübenbau', September, 1942, pp. 105-109 and 'Mitteilungen für die Landwirtschaft', September 1, 1942, pp. 543-545), makes a stand in favour of the use of sugarbeet leaves and crowns in human nutrition in the same way as the Swiss chard or white beet (*Beta cicla*) which has long been utilized as a food.

The chief objection to this use would seem to be the oxalic acid content of these parts of the sugarbeet. Dr SCHNEIDER, in carrying out analyses at the research laboratory of Rabethge & Giesecke, A. G., Klein-Wanzleben, obtained the following results:

	% oxalic acid in the fresh substance	
	leaves	stems
Rhubarb	1.4	0.8
Swiss chard	0.7	0.6
Sugarbeet	0.6	0.4

The figures for sugarbeet, therefore, do not exceed those for rhubarb stems and the stems and leaves of Swiss chard regularly allowed for human consumption. Consequently they do not constitute an obstacle. In a test made in 1941 by the Wehrmacht, several thousand men ate sugarbeet leaves and crowns without any aftereffect.

The albumin-starch ratio of the crowns, leaves and stems is similar to that of milk and their calorie content is practically double that of spinach. Experiments effected in Norway with a view to the utilization of different parts of the sugarbeet in human nutrition would appear to have given good results ('Zentralblatt für die Zuckerindustrie', Part 9, March, 194?): "The stems of the beets were cleaned and preserved in jars like asparagus. The leaves were used in the same way as spinach; the flavour seemed excellent". Dr HUPPERT of Bonn informed Dr HÜNERSDORF that he frequently ate beet leaves in place of spinach. "They taste at least as good as ordinary young spinach. There would be no question of a more or less good war substitute ('Erzatz'). They are even appreciably better than old or seed spinach".

It would seem that desiccation experiments carried out in 1941 indicated that "sugarbeet leaves are fully utilizable as a vegetable". "The leaves are utilized when harvested in the autumn. They are cut, washed and dried by means of the machines adopted for similar products. The dried product is a pleasing green colour. The taste... was agreeable... In any case, there was no bitter or even strong after-taste".

The experiments carried out this year on a larger scale will show what place, at least in the present circumstances, sugarbeet leaves and crowns may take in human nutrition.

A. H.

The spindle-tree and rabbits

Usually, animals are not allowed to eat the twigs and leaves of the spindle-tree or prickwood (*Euonymus europaeus*), known, in general, as a poisonous plant.

Nevertheless, a housewife of Apuania Province (former Carrara), not being able to supply her stock of rabbits with proper food and in sufficient quantity, thought to try the spindle-tree of which she had plenty.

The test was first made on a young rabbit and subsequently on all the animals of the hutch; the rabbits ate this plant willingly, digested it without any trouble, grew and bred normally. (*Il Popolo Apuano*, Apuania, 1942, anno 22, n. 45, p. 3, 1 fig.).

G. T.

BOOK NOTICES *

RIKLI, Martin. *Das Pflanzenkleid der Mittelmeerländer*. Bern, Verlag H. Huber, 1942, 1. Lieferung, 128 S., 26 Abb. Preis: 7.50 Sfrs. oder 4.50 RM.

The author presents a work of wide scope in which he utilizes in a masterly way the results of his research work for over forty years and the material collected in the course of numerous voyages. This work is not limited to the botany of Mediterranean countries, but also gives much information on the life and culture of these countries and thus is addressed to a much wider circle of readers than the title would lead to suppose.

This account, as interesting as a travel story, avoids all appearance of dry learning, while remaining purely scientific; it lets the personal feeling of the author be discerned and thus becomes enthralling.

The publication will cover about 1000 pages issued in two volumes. It comes out in 8 to 9 parts in all.

In this first part, the author introduces the reader to the splendour of southern landscapes with all the enthusiasm of an investigator entirely devoted to his task. From the threshold of Alpine vegetation he shows us the limits of the province of Mediterranean plant life. Then follows an account of the living conditions and the forms of life of Mediterranean flora. The grower, however, will find the most interesting the third chapter which, entitled: 'The olive, salient feature of the Mediterranean countries', deals with the natural history and economic importance of the olive.

N. v. G.

* Under this title, reviews are given of books presented to the Library.

ORSINI, Giuseppe. *Considerazioni sulla moltiplicazione dell'olivo. Origine e significato degli ovuli del colletto.* Todi, Tipografia Tiberina, 1942, 31 pp., 10 fig.

The author discusses and disproves the many arguments proposed in favour of propagation by seed and grafting and opposed to asexual propagation. Being rational, this latter method is successfully adopted in many countries for other plant species. This amounts to denying the harmful action attributed to propagation by buds. It is particularly true of the olive tree which can be propagated by buds without grafting with the certainty of obtaining a high percentage of success and of reproducing all the characteristics of the mother-plant, all the more so in that it possesses organs intended for this function ('ovuli'), organs to which it owes its prodigious longevity. ('Ovuli' is the word given in Italy to the embryonic buds which form small swellings on the stems; they are carefully excised and planted beneath the surface of the ground where they grow readily. Editor's note).

Taking as a basis a number – limited it is true – of observations, the author concludes that these embryonic buds appear more or less early on the collar of all olive trees and that under the influence of the soil they very soon put forth secondary roots which develop more rapidly than the main roots of the mother-plant.

Compared with the seed and grafting methods, asexual propagation is economic, of easy application and produces within 4 to 5 years vigorous plants already acclimatized after transplantation, which bear fruit before those grown from seed. Wherever this method has given good results, therefore, it should again be adopted. Olive-growers should establish on their land nurseries using embryonic buds or cuttings, in order to have available reserves stocks of olive plants for reconstituting olive-groves or for new plantings.

Prof. ORSINI recognizes that it is not easy to fix a variation by using buds, but he is certain that better results are obtained starting with 'ovuli' or cuttings than by grafting, owing to the unforeseen reactions the stock may determine in the latter case.

Practical experiments will be the best guide as to the method of asexual propagation to be followed. Those carried out in Umbria and Calabria may be widely copied in other regions.

The author also considers that despite the drawbacks observed in the asexual propagation of the olive, this method, by means of active propaganda, could serve, as in the past, for the reconstruction of the olive-groves of entire regions, without sacrificing or damaging the mother-plants. In its general outline, the thesis upheld by Prof. ORSINI coincides with the opinions expounded by Professors MORETTINI, MESSERI and others during the course of the meeting on olive-growing research which took place at Florence last May.

The publication concludes with a bibliography consisting of 45 titles.

E. M. DE B.

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

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MONTHLY BULLETIN

OF

AGRICULTURAL SCIENCE AND PRACTICE

PRESENT STATE OF THE BIOLOGICAL SYNTHESIS OF FATS AND ITS INDUSTRIAL POSSIBILITIES

Dr G. STAMPA

The use of the carbohydrates contained in rejected fruits, canning industry trash and many agricultural waste products to obtain fats by biological process, by employing certain species of fungi, constitutes an effectual means of increasing agricultural output by fully utilizing rationally and completely agricultural by-products. Besides the unit increase in oil production due to the improvement in cultivation technique and the intensification in the growing of oil-yielding plants, the industrial synthesis of fats by oxidation of paraffins and their production by biological means (for which yields much higher than the present are anticipated in the future) constitute two factors which would contribute appreciably towards meeting the shortage of fats evident in many countries of Europe. The various aspects of this problem are considered.

Introductory

The first studies on the transformation of carbohydrates into fats in animal and plant organisms dates back to the middle of the XIXth century. It was found for example that, in a pig fed exclusively on carbohydrates, the quantity of oxygen expired as CO_2 exceeds the quantity of oxygen fixed by respiration, namely, that the coefficient of respiration is greater than 1. This fact is explained by the change of substances rich in oxygen (carbohydrates) into substances containing less oxygen (fats). In the case of the growing pig, it is estimated that the quantity of fat thus formed is approximately 125 gm. per day. It was also observed that, in living organisms, fats may be formed at the expense of protein substances and that mould cultures of the *Penicillium* type in albumin and amino acid nutrient solutions are capable of forming fats,

Plant organisms, therefore, may, as well as animal organisms, effect the synthesis of fats from carbohydrates and proteins. Particularly effective are the fungi and, among them, especially *Endomyces vernalis*, as also different species of *Penicillium*, *Aspergillus* and *Oidium* (*O. lactis*, etc.).

I. Early studies

Studies on the phenomenon of lipogenesis or the biological synthesis of fats, however, only date back thirty years, and the first attempt at synthesis on a large scale is attributed to Germany. In this country, following investigations carried out by the Institute of Fermentation Industries (Berlin) and by other research institutions, were used yeasts having mycelia and particularly rich in fats, like *Endomyces vernalis*, and also ordinary yeasts, by associating the extraction of the fats with the peptonization of the yeasts themselves, so as to obtain mainly vegetal peptones and accessorily lipids (fats). After the 1914-18 world war, these studies were resumed by German and American investigators, in order to ascertain the best conditions of lipogenesis in fungi, to identify the most active species for the production of fats and to determine their physical and chemical characteristics. In general, it was found that the lipoid content depends, within certain limits, on the carbohydrate concentration of the nutrient medium, while it is independent of the nature and concentration of the nitrogenous substances present in this medium and, relatively, also of the glucid employed. This fact was first ascertained by PENIER and subsequently frequently confirmed by the findings, for example, of SMEDLEY and MACLEAN, BELIN, TRAUTMANN, TERRAINE and BONNET (who employed *Aspergillus niger*). It was also found that the lipid content may vary from 1 to 4 according to the carbohydrate concentration of the culture medium and, under favourable conditions, a lipid : carbohydrate ratio of approximately 90 per cent. can be attained, the carbohydrates being either ketohexoses or aldohexoses. A very simple explanation, but not exempt from objections, was this: the presence in nature of fatty acids with 18 carbon atoms being established, the transformation of carbohydrates into lipids would be effected by the condensation of 3 hexose molecules followed by a double process of oxidation and reduction ; in a similar way, fatty acids with 12 and 24 carbon atoms would be derived from the condensation of 2 or 4 hexose molecules respectively. However, the old system of alcoholic condensation by means of acetaldehyde (SMEDLEY and LUBRZYNSKA, TERRAINE and BONNET) has been revived, particularly since the above explanation has been supplemented by that of the intermediary formation of pyruvic acid, compound which appeared more and more as the corner-stone of every important metabolic reaction. The best conditions under which lipogenesis is produced have been gradually ascertained by establishing that the varying fat content (from 1 to 14 per cent. in the spores and 1 to 40 per cent. in the mycelium) is influenced by: the nature and reaction of the medium—the nature of the culture liquid and the substance it contains—the incubation period—and especially the intrinsic capacities of the fungus experimented (MARSHALL, PREUS, WARD, etc.). An interesting finding from the industrial point of view is that of BARBER, according to whom, the mixture of fatty acids formed by moulds of the *Penicillium* genus does not vary, whatever the energizing substance of the culture medium: glucose, levulose, xylose, saccharose and also glycerol (glycerine), whence the possibility of utilizing various economic sources for the production of

fats (fruit waste—xylose from the husks of sunflower seed and various other seeds—hydrolyzed bagasse from sorgo containing up to 73 per cent. xylose—wood sugar—waste sulphite water from cellulose factories—etc.).

II. Composition and yield of the fats obtained

The composition of the fats obtained varies appreciably according to the general conditions: oleic, linoleic, palmitic and stearic acids (containing 16 to 18 carbon atoms) predominate, particularly the first two, unsaturated. With the mould *Endomyces vernalis*, 25 per cent. fat was obtained, while with Aspergilli and Penicillia up to 41 per cent. was procured (in the case of *P. javanicum*) and, with *Oidium* species, even as much as 50 per cent. (with *O. lactis*).

The process employed during the 1914-18 war for the biological synthesis of fats consisted in placing a sterilized sugared solution (molasses, waste sulphite water, etc.) in capsules of magnalium (alloy of magnesium and aluminium) or else well enameled capsules, and then inoculating it with the mould. At the end of two to three days, the liquid is covered by a thick unbroken layer of the mould; the exhausted liquid was then carefully removed and replaced by a fresh nutrient solution. At a temperature of 18° to 20° C., the maximum of fat was obtained at the end of 7 days. The moulds, collected, washed and dried, served to prepare a nutritive paste for human alimentation or else, after desiccation the fat was extracted for alimentary or industrial use. The extracted substance was a reddish oil containing 6 to 8 per cent. free fatty acids, easily refined. The yields, calculated in relation to sugar consumed, were 12 per cent. with molasses and 18 per cent. with waste sulphite water after the addition of nitrogenous matter. Experiments were continued by the Institute of Fermentation Industries (Berlin), but the process did not prove economic under normal conditions, owing to the extensive surfaces necessary for the culture, heavy labour expense and also the frequent infections which reduced yield. In recent years, experiments have been started again with *Oidium lactis* (1). The nutrient liquid used is whey either alone or else mixed with other sweet liquids (residue from fruit industries, etc.). In this way a very economic nutrient medium is obtained and a high yield in fats gained; moreover, *Oidium* is very resistant to infection. On the other hand, the disadvantages due to the large surfaces required and high cost of labour have not been eliminated ; however, in view of the mechanization of today, the industrial problem of the biological synthesis of fats does not appear insoluble. The transformation of carbohydrates into lipids necessitates the presence of vitamins B and C, but these are often found in sufficient quantity in the added sweet liquids.

(1) In 1941, the Swede HUGO FREDHOLM (*Fette u. Seifen*, Berlin, Febr. 1942), found that by symbiotic cultivation of *Oidium lactis* with the bacteria of lactic acid in milk serum, a more rapid and higher production of fat was obtained. Analysis of this fat, soft and yellow in colour, shows: 42.8 per cent. saturated fatty acids, 42.2 per cent. oleic acid, 11.8 per cent. linoleic acid, 0.12 per cent. linolenic acid.

III. Studies of recent date in different countries

A very comprehensive series of studies on the possibilities of producing fats by means of fungi was undertaken in 1934 by LOCKWOOD and his co-workers. Studying the lipid content of 120 species of fungi, this scientist arrested his attention on *Penicillium javanicum*, capable of giving very high yields in fat (over 40 per cent. in proportion to the weight of the dry mycelium) and allowing a fairly wide latitude as regards the conditions and composition of the nutrient medium. LOCKWOOD studied: the influence on yield in lipids exercized by different cations and anions —the *p*H of the nutrient medium—the duration of the culture in relation to the aforesaid yield—composition of the fats—composition of the mycelium—etc. He established that the highest production in lipids is obtained by employing 20-30 per cent. glucose mineral solutions containing: 2.25 to 3.37 p. p. 1000 ammonium nitrate—0.25 p. 1000 magnesium sulphate —0.3 to 1.2 p. 1000 monopotassium phosphate—and having an optimum *p*H of 3.1 to 6.8, which drops to 2.5 on termination of the experiment. Nitrogenous salts make little difference ; the best is ammonium nitrate. A slight activating effect was caused by the presence of Ca, Mo, W, Fe and Cr ions.

These studies were subsequently followed by the research work of WARD and his collaborators. They stated that, to obtain the maximum yield in lipins (41.5 per cent. in proportion to the weight of the dry mycelium) in solutions of mineral cultures containing 41 per cent. glucose, the greatest importance should be attributed to the ratio volume of culture medium: total surface inoculated, so that the liquid is disposed in thin layers in order to increase the surface inoculated without augmenting the volume. These investigators also studied the chemical characteristics of the fat obtained from *Penicillium javanicum* and other *Penicillium* spp., which contained 30 to 34.6 per cent. saturated fatty acids and 60.8 to 62 per cent. unsaturated fatty acids. The former were composed of $^{7}/_{10}$ palmitic acid and $^{3}/_{10}$ stearic acid ; the latter contained oleic and linoleic acids in practically equal proportion.

In Italy, GAROGLIO and R. CIFERRI (professors of the Faculty of Agriculture and Forestry of the University of Florence) carried out, from 1937 to 1940, research work on: *Mucor* spp. (which had never been thoroughly tested)—an asporogenous yeast (*Torulopsis lipofera*)—an *Aspergillus*—a *Trichoderma*—6 *Penicillium* spp., including *P. javanicum*, which was subsequently studied in greater detail. The best nutrient medium adopted contained, per litre: 22 gm. commercial glucose, 2.3 gm. ammonium nitrate, 0.25 gm. magnesium sulphate and 0.3 gm. monopotassium phosphate.

Incubation was effected at a temperature between 25 and 30° C. for a period varying from a few days to 60 days from inoculation. The fat was extracted from the washed and dried mycelium placed in a Soxhlet extractor for 18 to 24 hours. Under the conditions of the experiment effected, it was possible to confirm the importance attributed to the ratio volume of culture medium: total surface inoculated. Taking as basis a total inoculated surface as equalling 100 and also considering as 100 the weight of the dry mycelium obtained, if this surface was reduced to 47—without dimunition in the volume

of the culture medium—there was a fall in yield of lipins to 23 per cent., namely of 77 per cent. In the experiments, pure and mixed cultures were used. The *Mucor* spp. yielded 16.9 to 25.4 per cent. fat (the latter percentage with *Mucor racemosus*). With the Penicillia the yield amounted from 15.45 per cent. (with *P. flavocinereum*) to 19.1 per cent. (with *P. piscarium*). In 135 cultures, *P. javanicum* yielded on an average 18.52 per cent. fat in relation to the weight of the dry mycelium.

* * *

In short, the Mucoraceae are richer in fat than the Penicillia; but as the unit yield in dry mycelium—if the volume of the culture medium and the inoculated surface are the same in both cases—is much less for the *Mucor* than for rhe *Penicillium* spp. these latter give, in fact, a much higher yield. As regards the trend of the yields obtained with *P. javanicum*, it was observed that, taking into account the fact that a rapid increase in weight of dry mycelium takes place up to the 28th to 30th day and that, on the contrary, the maximum content in lipids is found in the young mycelium and decreases slowly up to the 26th to 30th day, then more rapidly, under the conditions in force in the experiment, the maximum yield in fat was obtained between the 26th and 30th day.

The physical and chemical characteristics of the lipids obtained from *Penicillium javanicum* place them in the category of semi-drying oils, containing less linoleic acid than oleic acid. The following table shows the data obtained by WARD and by Professors GAROGLIO and CIFERRI respectively.

Physical and chemical characteristics of oil from Penicillium javanicum

	Experimenters: WARD	Experimenters: CIFERRI and GAROGLIO
Specific gravity at 25° C.	0.9145	0.9200
Melting point	15° C.	12° C.
Solidification point	6-7° C.	2-3° C.
Refractive index	1.468 (at 25° C.)	1.472
Iodine value	78 to 88	65.06 (in the oxidized type) 78 (in the non-oxidized type)
Saponification value	181-183	190-191
Saturated fatty acids %	30.8-34.6	34-35
Unsaturated fatty acids %	60.8-62	62
Unsaponifiable substances %	2	1.4
Melting point of saturated fatty acids	52.5° C.	—
Mean molecular weight of saturated fatty acids	272	273
Acetyl value	10.7	—
Reichert-Meissl number	0.3	—
Free acidity expressed in oleic acid %	—	10.92
Linolenic acid	—	—

* *Tec. 12 Ingl.*

Compared with semi-drying oils, that from *Penicillium javanicum* generally contains a much higher quantity of linoleic acid and a lower proportion of oleic acid, and its characteristics greatly resemble those of grapestone oil. According to the analysis results, it could be identified with: olive oil for the value of the iodine number (79.2-88)—apricot kernel oil as regards the saponification value (191.2-193.1)—kapok oil for the refractive index (1.471)—cottonseed oil for the solidification point (3-4° C.).

Cottonseed, sesame and soybean oils contain mainly the same unsaturated fatty acids as the oil from *P. javanicum*. As regards the proportion of glycerides of saturated and unsaturated fatty acids, the oil which most resembles that from *P. javanicum* is star anise oil (*Illicium anisatum*) as can be seen from the following data:

	In the *P. javanicum* oil analyzed %		In star anise oil %	
Oleic acid glyceride	33.2	63.7	50	75
Linoleic acid glyceride	30.5		25	
Palmitic acid glyceride	22.4		24	
Stearic acid glyceride	9		1	

In the case of the iodine number of oil obtained from other *Penicillium* species (*P. oxalicum, P. roqueforti, P. piscarium, P. flavocinereum*), only in *P. piscarium* oil does it approach that of semi-drying oils, while as regards the other *Penicillia*, this value comes close to that of the common vegetable oils.

IV. — Possibilities of modifying and improving fungi cultures by hybridization

Up to date work has been limited to choosing and selecting cultures of yeasts and other micro-organisms existing in nature which present a practical value for industrial purposes (production of alcohol, citric acid, glycerin, etc.); however, no crossings have been made between the different organisms in conjunction with their selection, with a view to combining the hereditary good properties of the various types. Of these two systems which have been so successful in plant cultivation and stock-breeding, crossing had never been practised because there was no exact knowledge of the reproduction of *Saccharomyces*, the Ascomycetes in general and of other fungi, an indispensable preliminary condition to such work. According to the prevailing opinion, sexual phenomena did not occur in the true yeast, reproduction having to be effected by parthenogenesis. Consequently, studies on crossing with a view to obtaining new types of yeasts remained unsuccessful. It is due to WINGE and his co-workers that the study of the biology of yeasts was again taken up, starting from the supposition that the Saccharomycetes generally accomplish a biological cycle similar to that of the higher plants, as was inferred by KNEIP (1928). Following the investigations of KRUIS and SAVA, then those of WINGE, A. GUILLERMOND resumed, in 1935, the study of

the Saccharomycetes and, using the VAN TIEGHEM and LE MONNIER chamber, confirmed the results of WINGE by experiments on *Saccharomyces paradoxus*, showing that coupling may take place either between the germinating ascospore and the first daughter-cell produced from germination, or between two daughter-cells, and that these phenomena may occur simultaneously beginning from the same ascospore. He also proved the close relation existing between the evolutive cycle of the Saccharomycetes and that of the Exoascales.

Subsequent investigations by WINGE and LAUSTSEN (1937-38) on the hybridization of yeasts indicated that the biological unit should not be, as was previously assumed, the yeast but the spore. The customary parthogenesis infallibly leads to a deterioration in yeast species. After having proved that a sexual combination exists between ascospores, WINGE and LAUSTSEN succeeded in uniting the spores of different yeasts, thus obtaining hybrids which combined the specific qualities of two yeasts into an improved type with a higher production.

By crossing *Saccharomyces ellipsoideus* with *S. validus*, they obtained a hybrid which combined the improved characteristics of the parent fungi and possessed a greater vegetative vitality than either. In 9 per cent. sugar solutions, they found the proportion of sugar transformed into lipids by the hybrid to be 72.2 per cent., as against 63.9 per cent. using *S. ellipsoideus* and 57.7 per cent. with *S. validus*.

Numerous subsequent hybridizations effected between different species of *Saccharomyces* and the improvement of the characteristics they produced prove the importance of this new means of ameliorating the quality and yield in industrial fermentation processes.

Conclusions

The above account gives some idea of the importance of the possibility of obtaining fats by employing certain species of fungi and, among these, in particular *Endomyces vernalis*, *Penicillium javanicum* and *Oidium lactis*.

By utilizing the excess carbohydrates available in the case of a possible closing of the market for fruit production, as well as the unmarketable and spoiled fruit, the by-products from fruit canneries and other plant and animal industrial by-products, fats can be produced at a reasonable cost not only in exceptionable circumstances but also under normal conditions, if account is taken of the different uses which can be made of the substances after extraction of the lipids (products for human and animal alimentation, etc.), and of the possibility of improving industrial output by modifying the rate of synthesis so as to obtain, according to case, besides the fats, a greater production of certain compounds of intermediary value (various organic acids, nitrogenous products *et al.*)

We believe that the production of fats by biological synthesis can be developed parallelly with the important industry of synthetic fats obtained by the oxidation of paraffins (FISCHER and TROPSCH system), which, since 1940, replaced in Germany 15 per cent. of the imports in fats and met 20 per cent. of the soap industry requirements in fatty acids. Manufacture, however, necessitates a complicated and expensive equipment for the oxidation, separation and purifi-

cation of the fatty acids obtained. Contrary to the lipids prepared by the biological method, the product is composed almost entirely of saturated fatty acids, different, from the natural unsaturated fatty acids of the oleic acid type, so that this process does not yet solve the problem of the synthetic production of unsaturated fatty acids, contained chiefly in edible oils and fats.

The production of oils by biological means can be carried out with more simple equipment * and constitutes in itself a more elastic industry by the fact that it is possible to obtain different products according to the requirements of the market. By employing mixed cultures and new types of fungi obtained by hydridization, this industry could probably furnish fats resembling more the natural fats in common use. The utilization of numerous unmarketable fruit products and agricultural and industrial waste, will contribute to attenuating the fats crisis from which Europe is suffering.

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PRODUCTION OF CLARIFIED BUTTER, PROBLEM OF PRESENT INTEREST *

Dr ELBA GASSER

A simple means of rendering foodstuffs conservable has, at all times, consisted in cooking them, and, for centuries, this system has been adopted to produce good keeping butter. In recent years, this purely cottage industry developed to the extent of becoming a veritable manufacturing industry founded on a scientific basis and utilizing all the latest conquests made in technique. The following study describes this evolution and the present state of the production of clarified butter prepared from cows' milk.

I. Introductory

These last few years, the industrial production of clarified butter has acquired a fresh importance, as butter and its conservation are, today, more than ever to the fore in the industry and economy of fats. If, on the one hand, enormous progress has been attained in the conservation of butter by storage, on the other there is always some butter which, because of its quality or for some other reason, cannot be kept for a long time in storage without undergoing detrimental changes.

The climate plays a decisive part as to the method of preserving butter, as is seen from the fact that, in some countries, particularly India, Persia (Iran), and Egypt, the question of the conservability of butter was already solved centuries ago by the production of clarified butter. That prepared in India and called G h e e, is made chiefly from the milk of the buffalo, though cow's and ewe's milk are also used; on the other hand, R o g h a n produced in Iran is from ewe's

* See in the June, 1942 Bulletin, pp. 241-261, the article of Dr Elba GASSER entitled "Changes in butter during storage"

milk; in the preparation of the Egyptian Samna and the Arab Zibda the butter from the milk of different animals is employed.

In Europe also, however, the production of fused butter (using cow's milk) has long been known. For instance, TEICHERT cites publications which date back to the following years: 1751, Medical and economic treatise on butter and its different uses and advantages, by Dr WALTER – 1788, Physical and chemical properties of different milks, with a special chapter on clarified butter, by A. PARMENTIER – 1830, Theoric-practical instruction on the art of butter-making, etc., by S. Fr. HERMBSTADT. Later, precise details on the preparation of clarified butter are found in the works of J. ANDERSEN, W. FLEISCHMANN, EUGLING, MARTINY, etc.

These various descriptions give interesting information on the additions practised in order to increase the conservability of the fused butter. Thus ANDERSEN recommends salting the butter or better mixing it with honey in the proportion of 1 to 16 to obtain a good keeping product. Another method consisted in mixing 1 part sugar with 1 part saltpetre and 2 parts salt, incorporating the whole into the clarified butter in the proportion of 1 to 16. On the other hand, FLEISCHMANN recommends the addition of 2 per cent. flour or semolina and EUGLING an aqueous solution of aluminium sulphate.

II. Definitions and composition of clarified butter

SCHULZ and MEHLHOSE consider that clarified butter is the very dehydrated fat obtained from butter by heating and fusion (involving the separation of the fluidified butter from water and albuminoids).

According to SOMMERFELD, the clarified butter usually found in South Germany is butterfat freed from the buttermilk by fusion or cooking.

To produce clarified butter, the butterfat must be pure, containing no extraneous matter; the object of the fusion or cooking process, therefore, is to separate out all the non-fatty components. Its efficacy in prolonging the conservability of the butter lies primarily in elimination of the water. On comparing the composition of raw butter with that of clarified butter, above all the difference in water content is remarked, as is well evidenced in the following table:

Comparative composition of raw and clarified butter.

Components	Raw butter		Clarified butter (according to TEICHERT)
	Fresh	Salt	
Fat	83.6 %	83.9 %	99.73 %
Water	16.0	14.5	0.24
Anhydrous non-fatty matter without salt	0.4	0.4	0.03
Salt	—	1.2	—
	100.0	100.0	100.00

The majority of the micro-organisms cannot live in a product almost entirely deprived of water such as fused or cooked butter. In this respect, the elimination of lactose, the albuminoids and salts caused through fusion naturally also play a part, but of secondary importance.

III. Types of clarified butter

According to the raw material employed, a distinction was made between the clarified butters prepared from cow's, ewe's, goat's and buffalo's milk.

In Europe, in America and to some extent in Australia, the butter from cow's milk is that chiefly adopted for the purpose, while in Asia and Africa, the butter of the buffalo and ewes is the most widely employed. Of the latter type, particular mention may be made of Ghee, which, in India, is produced principally by heating buffalo butter, although other butters are also used. The raw material is unsalted butter which is heated at temperatures varying, according to the season, between 122° and 130°C., as indicated by V. PATIL and B. HAMMER. In deciding when to stop heating, not only the temperature, but also the sound and foaming of the heating material as well as the appearance of the curd were taken into consideration. By heating, a large quantity of water is evaporated and, by filtering, part of the curd which tends to form floccules, is eliminated. Because of the high temperatures employed, Ghee has a pronounced heated flavour and odour. It never shows the waxy texture of table butter and is commonly grainy and brittle. At high temperatures, there may be considerable oiling off. As it keeps well at temperatures that woud be out of the question for ordinary butter, production is of particular importance in hot countries where there are little facilities for keeping raw butter by cooling.

Ghee is ordinarily employed on various types of bread and in the cooking of meat, fish, vegetables, rice, etc. Large quantities are used in the sweetmeat industry. It is also utilized for medicinal purposes when it is prepared from cow's milk and especially when it is very old.

Among the clarified butters obtained from ewe's milk, mention should be made of Roghan, which is the most important dairy product of Iran. The use of pig's fat being prohibited by the religion of the country (Mohammedan) and the people not liking oil, most foods, are prepared exclusively with Roghan. It is obtained from ewe's butter which is first washed and then heated; heating, however, is not continued as long as in Europe; it consists rather, according to STAFFE, of a simple liquefaction, during which the scum which rises to the surface is removed two or three times. At the end of this operation, the Roghan while still warm is poured into goatskin bottles and, in this form and packing, it constitutes a very common article of trade throughout Iran. At the time of purchase, a hollow taster of peculiar shape is introduced into the contents in order to take a sample to be examined for flavour, odour and colour, which should be a fine yellow. Adulteration with Pih (fat from the fat tail of certain sheep) can be immediately detected from the taste, and better still by the fact that this fat solidifies more rapidly than the pure Roghan.

The manufacture of clarified butter from c o w ' s m i l k has been known for centuries in Europe, particularly in South Germany, Ostmark (Austria), Switzerland, France, etc.

FLEISCHMANN considers that the best types of clarified cow butter are obtained by heating good quality butter in a water bath at 40°C., leaving it for several consecutive hours until complete clarification, and finally decanting the fused butter off from the deposit. When slightly rancid butter is employed, it is heated at higher temperatures (70° to 90°C.), taking due precaution, for 1 ½-3 hours, operation which eliminates not only the water but also the volatile substances (fatty acids, etc.). From the scum and deposit, a fatty substance suitable for everyday kitchen use can be obtained.

IV. Manufacturing processes

As long as clarified butter was prepared solely for household use, there was practically no manufacturing system known as each household had its own method based on personal experience. Matters changed when clarified butter became a regular article of trade for which certain requirements were formulated: (1) fusion properly so called — (2) boiling and also (3) combined or mixed processes. These all aim at eliminating the buttermilk as completely as possible and thus obtaining a product having a butterfat content of as near 100 per cent. as possible. The products obtained vary according to the degree of temperature:

The lower the degree of fusion (fusion properly so called), the more the product resembles ordinary butter.

On the contrary, the higher the temperature (boiling), the greater the difference in taste from ordinary butter.

The manufacturing process varies according to the destination of the product obtained. Usually it is a question of manufacturing it for use as such, but experiments have also been made with a view to obtaining ordinary butter from clarified butter, experiments of importance for the future.

1. — FUSION METHOD.

HENKEL, FLEISCHMANN and other investigators recommend a temperature of 40° C. or possibly 45° C. HENKEL considers that anhydrous kitchen salt should be added to the butter to be clarified for the supplementary drying. According to MOHR and EICHSTÄDT, at 40° C. a limpid fat is obtained with fusion lasting 8 hours. KRETSCHMER states that for moderate heating the temperature should be about 50° C. and continue for six hours.

In clarifying butter a suitable receptacle is a well galvanized copper or tinplate boiler. Heating is generally effected on a water bath in order to prevent sticking at the bottom of the receptacle and ensure careful treatment of the product. In this way, using pure butter, the finest fused butter can be obtained.

According to TEICHERT, for this operation, the receptacle may be of porcelain, earthenware or enamelled iron; this is filled, though not up to the top, with

the butter to be clarified (freshly prepared, properly worked and, in every way, irreproachable). The whole is placed in a larger receptacle containing water heated to 80-100° C. and left until the froth no longer forms on the surface of the fused product.

When the butter is completely fused, the liquid fat obtained is left to stand and forms two superposed layers: the top layer, composed of fused butter, which solidifies after a certain length of time, and the under one, formed of buttermilk collected at the bottom. This latter can be removed after complete solidification of the fat; however, some buttermilk always remains in the fat, but can be eliminated by still further heating.

The characteristic of the fusion method, therefore, is that only the residue of the buttermilk is volatilized, as the greater part is eliminated in the liquid state owing to the separating out of the two superposed layers.

To a certain extent, for the manufacture of clarified butter the fusion process is more economic than the cooking or boiling method, as less heating is necessary; on the other hand, however, the distinct separation into two layers may prove difficult especially in the case of ripened butters.

The fusion method, therefore, should aim primarily at carefully separating out the water from the butterfat by heating at a moderate temperature, after which the fat is purified either by letting the aqueous part (buttermilk) collect at the bottom and then filtering, or else by eliminating the liquid by centrifugation.

Butter can also be fused by insufflating steam which liquifies it very rapidly. TEICHERT, however, considers that the use of steam has its disadvantages, such as the setting free of odorous principles and the emulsion of the albumin and water with the butterfat (formation of free fatty acids).

2. — COOKING PROCESS.

By heating butter on an open fire, the product obtained can be kept longer; on the other hand, however, there is the risk of the liquid fat boiling over. Moreover, it is with this method that the water is best removed and the micro-organisms which decompose the fat killed (105-110° C.). According to TEICHERT, while heating the butter should be skimmed continually.

Even with this method, however, the butter should not be heated at too high a temperature, otherwise some of its constituents will decompose, thus reducing yield, darkening the colour of the product and at the same time giving it a scorched or even burnt taste and odour of a butyric ester or burnt cheese.

Interesting studies have been carried out in Switzerland on the cooking of butter. According to W. RITTER and Th. NUSSBAUMER this process is effected as follows: As in the fusion method, the first stage in cooking the butter is melting, during which, while still, part of the liquid contained in the butter separates out at the bottom forming an aqueous layer. When fusion is completed, the temperature rises and then begins the cooking properly so called with the evaporation of the water, during which the fairly large amount of water which had collected

at the bottom of the receptacle during cooking again passes through the mass when stirred from time to time.

Slightly before the water contained in the butter attains boiling point, the volume of the liquid fat starts increasing appreciably and, immediately afterwards there is intense frothing, due to the evaporation of the first portions of water. At this moment there is the risk of the liquid fat boiling over. In consequence of slight overheating of the buttermilk (1-5° C. above boiling point), due to delay in boiling, this latter is subsequently irregular and spasmodic. With relatively rapid boiling, the buttermilk is well mixed in with the butter so that there is no longer any necessity for vigorous stirring.

As the cooking advances, the first formation of froth diminishes rapidly, then ceases when boiling becomes more even. During the greater part of the process, the fat is very turbid owing to the presence of droplets of water. The evenness of boiling depends on the distribution of the water in small droplets in the fat, for which it appears that the original condition of the buttermilk in the butter is of importance. As soon as the greater part of the water is evaporated, namely, as soon as the water content of the fat corresponds to the degree of saturation of the solubility of the water in the hot fat, clarification takes place. In fact the fat, at first turbid, becomes clear and transparent, while the buttermilk still left collects in slightly larger droplets already containing a fairly large proportion of dry substance. On evaporation, these droplets or particles of buttermilk become smaller and more compact; however, they still retain, for the moment, their white colour.

In the subsequent stages in cooking, these particles of buttermilk begin to turn brown in colour. The characteristic odour of cooked butter then appears and the second brown, often very thick layer of froth starts to form. During this phase, when the temperature of the mixture attains 108° C., care must be taken in heating in order to avoid boiling over. Subsequently, the brown froth disappears and in its place is formed a less consistent, rather whitish layer with larger bubbles. The temperature rises still further up to 110° C., because only a very small quantity of water is now evaporated. The pleasing odour of cooked butter and a very slight browning of the fairly limpid fat indicate the end of the cooking process.

The residue is deposited at the bottom of the receptacle and the clear fat can be drawn off, but it is advisable to filter it in order to separate out the fine particles which do not sink to easily.

After the fat has cooled down to a moderate temperature, it is poured into tin cans and left to crystallize.

3. — Combined processes.

Besides the simple methods of fusion and cooking, there are the combined or mixed processes with which the butterfat is obtained by means of various successive treatments (such as fusion, separation, heating, etc.). It is particularly in Germany that the technique of these mixed processes has, in recent times, attained a high degree of perfection. The ' Bayrische Milchversorgung G. m.

b. H.' (Bavarian Association for Milk Supplies) at Nuremberg has effected important studies on the question with which, for technical reasons, the system of cooking butter in fixed vats is no longer used—formerly, the butter was heated to 70-96° C. in cheese vats with furnace casing, and then maintained hot for 1 to 3 days, after which the limpid cooked butter was removed. On the one hand, this method requires too much space and time, on the other, not only may the product retain the rancid taste of a bad butter used as raw material, but, the longer the fat is kept hot the greater the degree of rancidness.

To eliminate these disadvantages, M. SCHULZ and W. STORCK have initiated a new process employing a centrifugal machine to clarify the fused butter using intense heat (V7 type of pasteurizer from the Bergedorf Ironworks). The following processes were effected: In such a pasteurizer, 2 to 4 quintals of butter melt in a few minutes. As very rapidly fused butter is often difficult to centrifuge, it is cooked until the emulsion splits up, which only takes place after the evaporation of a large quantity of water. The removal of the water in the form of steam from 2 to 4 quintals of butter (under atmospheric pressure) eliminates the rancid taste in 30 minutes. At the end of the operation, the temperature of the liquid butterfat is slightly over 100° C.; however, owing to the rapid heating there is no cooked taste.

No difference can be distinguished as regards taste between the product obtained by this process and that which is separated after fusion from the aqueous layer by centrifugation.

In order to prevent the centrifuge being blocked by sludge, at first hot water was always flushed through. The product subsequently obtained was very limpid and the water residue only contained 0.05 to 0.01 per cent. fat. However, as centrifugation with the use of water also removes important constituents from the butter, it is now preferred to cook the butter thoroughly and subsequently to centrifuge it without the afflux of water.

To prevent the centrifuge fouling too rapidly, the transmission tank which is placed above the centrifuge is equipped with two lateral drain-cocks (one at the bottom, the other half-way up).

The liquid fat on emerging from the centrifuge flows down a spiral-grooved cooler reducing the temperature of the product to about 20° C. Despite this cooling, it remains perfectly fluid and it is only subsequently that, accelerated by stirring, the crystillazation and solidification of the fat takes place.

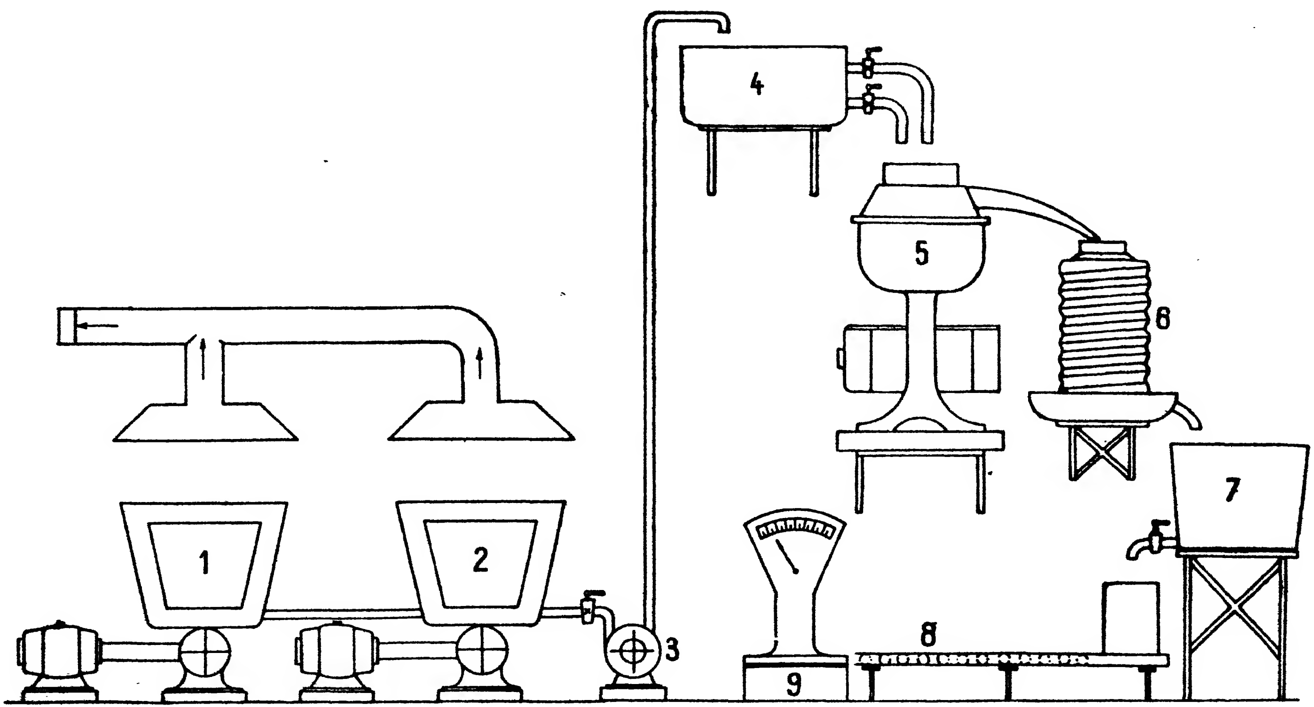
On the following page a diagram is given of a plant for the manufacture of clarified butter according to the combined process described by SCHULZ and STORCK.

According to KIEFERLE, the manufacture of clarified butter begins, as a rule, with: (*a*) the p r e l i m i n a r y c l a r i f i c a t i o n of the butterfat in a suitable receptacle for the preliminary fusion. The best temperature is from 70 to 75° C. because it not only produces a fat free from germs but also renders inactive the lipolytic enzymes.

After the preliminary fusion follows: (*b*) the 1st c e n t r i f u g a l s e p a r a t i o n. With this first separating out of the fat clarified at first with the afflux of hot water, the proportion of non-fatty dry matter may be reduced to 0.1-0.05 per cent.

Diagram of a plant for the manufacture of clarified butter

(SCHULZ and STORCK)



1 and 2. Pasteurizers with mechanical mixer (or other heating apparatus) — 3. Pump — 4. Transmission tank (equipped with two drain-cocks) — 5. Oil centrifuge (for separating the fused butter) — 6. Spiral-grooved cooler — 7. Collecting tank with mechanical mixer — 8. Endless band — 9. Scales.

The object of this process is to eliminate not only the constituents of the non-fatty dry substance but also the decomposition products having a sour, rancid or rotten odour or taste.

It has been found that a good preliminary clarification facilitates separation, but that a more or less extensive separation is of less importance for the clearness of the clarification effected by a separator.

After the 1st centrifugal separation follows: (*c*) Heating of the decanted fat, the primary object being to reduce still further the water content of the butterfat. This content which varied, for the examples examined, between 0.54 and 0.20 per cent. after the first separating out, fell to 0.26-0.07 per cent. after heating.

The reduction in water content depends, on the one hand, on the degree of temperature employed and, on the other, on the duration of heating. The water being finely divided through the butter, cannot be eliminated even under a vacuum. Instead of heating in stationary boilers, the tendency today is to effect this operation in continually revolving apparatuses, such as drum or disc pasteurizers, in which, despite the brief duration of heating, the water is thoroughly removed.

According to KIEFERLE, the following results, for example, can be obtained: by heating in a cylinder to approximately 105° C. a separated fat containing 0.45 per cent. water, the moisture content can be reduced to 0.26 per cent. and afterwards, by heating still further at 100-103° C. for about 30 minutes, to 0.15 per cent. In order to lower the water content still more, usually a (*d*) 2nd centrifugal separation, which generally reduces it to 0.10 per cent., is effected; in the instance cited by KIEFERLE, this percentage even dropped from 0.17 to 0.03. This same investigator is of the opinion that, in practice, after heating the butterfat in the revolving apparatus, the 2nd centrifugal separation can be operated directly without continuing heating in the stationary boiler, as, in this way, the admissible limit of 0.3 per cent. for the water content is not exceeded.

V. Properties of the products obtained on fusing and cooking butter

As butter has no definite fixed melting and solidification point, its texture is influenced appreciably by the method of cooling adopted as may be seen from the following data:

As is known, butter is composed of the glycerides of different fatty acids, chiefly of oleic, palmitic stearic and butyric, acids, and also of many others, saturated and unsaturated, present only in small quantities. The mixture behaves as if the glyceride of oleic acid was the solvent, in which the glycerine palmitate and stearate would be dissolved. Owing to this mixture of substances of varying solubility, RAHN considers that cooked butter cannot have a well defined melting point nor solidification point.

In the first place, both depend on the rate of cooling. According to the degree of cooling employed, different types of fused or cooked butter are obtained: having a very fine and uniform texture if cooling is very rapid— a rela-

tively coarse texture and no definite oil formation if moderate— a mixture of fairly large grain with a residue of butter oil if cooling is very slow.

The finer the texture of the fat obtained the clearer the colour and vice versa.

In the second place, the texture of the fused or cooked butter depends also on the extent to which it is stirred, which makes for uniform crystallization. Stirring, in fact, prevents the grain already formed, which corresponds to the part most difficult to fuse, sinking to the bottom.

At the same time, the composition of the crystals always more easily fusible, which subsequently separate out, is modified until only the butter oil remains.

Naturally, the laws of crystallization also play their part in the formation of the texture of the fused or boiled butter.

As regards the rate of formation and the rate of development of the grain in the fused or cooked butter, nothing definite is known as yet, and one is reduced to empirical knowledge.

The air imprisoned in the product also affects its solidification.

To obtain a finely crystalline product, according to W. RITTER and Th. NUSSBAUMER, the fused mass is cooled fairly rapidly to 30-32°C. and at this temperature inoculated with fine grain solidified clarified butter. The fat thus obtained is very compact. When the temperature rises, it becomes soft and even semi-liquid and, if it has not been heated excessively, so as to remelt it completely, it solidifies on again cooling with the same firm, finely crystalline texture.

The mode of cooling or crystallization is highly important insofar as regards the texture from the standpoint of packing, transport, etc.

Among the properties of clarified butter, the chief is its greater conservability over that of ordinary fresh butter. It combines, so to speak, all the desirable qualities in a good fused or cooked butter; it may even be said that the aim in manufacturing these products is exclusively that of increasing conservability.

The fat content of the product should never be lower than 99.5 per cent. and its total water and anhydrous non-fatty matter content should never exceed 0,5 per cent. The product should be pure from the bacteriological viewpoint. Finally, there should be no unpleasant, acrid or burnt taste.

It goes without saying that the quality of the clarified butter depends on different factors, such as: manufacturing process— type of original butter— composition of the anhydrous non-fatty matter.

The condition of the product and consequently its keeping quality depend, in a sense, on the quality of the fresh butter employed. As has already been seen, this dependence varies according to the method used. Thus, for example, the product obtained by simple fusion still contains the principles of the original butter which confer the odour and taste; they pass, in fact, into the fused butter according to whether a good fresh or else a rancid butter was employed. On the other hand, in cooked or boiled butter, the original principles giving a good taste and odour or otherwise, are volatilized and replaced by the characteristic odour and taste of cooked butter. In the case of clarified butter prepared by combined processes (comprising preliminary fusion, separation, heating, etc.), it no longer has the original principles of a disagreeable odour and taste, but at the same time, it has lost the odour of fresh butter.

The method of preparation also influences the chemical composition of the fused or cooked butter. In this respect, the water content and the proportion of protective or anti-oxidant substances (phosphatides) are of particular importance.

1. — Water content.

The lower the water content the greater the conservability of the product. The reason for which fused or cooked butter is not completely anhydrous is due to the solubility of water in the fat. This solubility is, it is true, low but, nevertheless, worth noting; for example, it amounts to about 0.2 per cent. at 42°C. It increases with rise in temperature so that at 100°C. the fat absorbs more water than at 60° and, at 125°, more than at 100°C. On the other hand, however, the higher the temperature the greater the tendency of the water to evaporate. This is why butter fused or cooked or treated according to a combined process, contains a low percentage (0.3) of water. Various treatments as, for example, filtration, may lower this content still further down to 0.08 per cent.

The water content is particularly important as regards the conservability of fused or cooked butter as it is on it that the following depend: possibility of the existence of micro-organisms — formation of rust in the tin containers— tallowiness — proportion of protective substances in the product.

A condition generally necessary for the appearance and development of micro-organisms is moisture. As, however, in butterfat the water is dissolved and not in the free state, it cannot be utilized by the micro-organisms which would possibly occur in the fused or cooked butter.

To prevent micro-organisms in the product, Ritter and Nussbaumer consider that the butter should be cooked at a fairly high temperature (as high as 110°C.) for a fairly long period. It stands to reason that this cooking destroys practically all the micro-organisms contained in the original butter. On the other hand, it has been possible to establish that, in a fat had by carefully fusing butter at a low temperature (for example 42°C), in general there is no bacterial activity, which is naturally also the case with butter fused at a temperature between 70 and 90°C. using a combined method.

Investigations of Ritter and Nussbaumer on the formation of rust in tins containing cooked butter have indicated that rust can only occur if the butter contains at least 0.15 per cent. water and, at all events, the water must be of a certain volume, for example, in the form of drops. This fact is rarely due to insufficient cooking: rather it takes place when the fat contains so much water that it separates out on cooling sufficiently slow for the water to descend. On the contrary, when cooling is effected rapidly, the water is so evenly distributed that if it eventually separates out, it is of little importance.

More or less large drops of water may result in the containers when the aqueous buttermilk remaining in the drain-cock of the boiler where the butter is fused or cooked, passes through while the liquid fat is being drawn off. Therefore, it is not only the water content of the fused or cooked butter which is of importance but also the method employed in drawing it off and cooling it. The formation

to the presence of small quantities of water naturally also depends on the quality of the material employed in making the containers, especially in the proper tinning of the sheet-metal.

RITTER and NUSSBAUMER consider that to prevent the formation of rust, in general it is not necessary to heat the containers, before pouring in the clarified fat, in order to remove the film of moisture which covers the inner surface, nor to rub the surface with dense anhydrous oil or with some fat, as is sometimes done in other industrial branches.

The water content of clarified butter also promotes oxidation which in turn produces tallowiness.

Connected with the water content is also the content in protective substances which are important in rendering the product resistant to oxidation. This point will be discussed in greater detail in the following chapter.

2. — CONTENT IN PROTECTIVE SUBSTANCES (PHOSPHATIDES).

Irrespectively of method of preparation employed, for reasons of solubility indicated earlier on in this article, water cannot be completely eliminated in fussed or cooked butter. On the other hand, the choice of method may affect the presence of protective or anti-oxidant substances, for example, phosphatides, in the product.

W. RITTER and Th. NUSSBAUMER have carried out much research work on this question showing that cooked butter filtered while hot contains small quantities of these protective substances (phosphatides), while they are wanting in a butter simply fused at a low temperature. In a product obtained using a combined method, however, the presence of phospatides and other anti-oxidant substances depends on the treatment with the afflux of hot water.

The presence of these protective substances exercizes a decisive influence on the resistance of fused or cooked butter to oxidation: this resistance is increased.

It is not known whether these protective substances are only the phospholipids of butter (lecithin, cephalin and sphingomyelin, the first being the most abundant, the second the most active), or whether it is a question of other substances. In any case, the phosphatides of butter are not the sole factors affecting the conservability of clarified butter, for its keeping qualities may be good without it being possible to detect, by simple reactions, the presence of phosphatides.

As these protective substances are wanting in pure butter fused at as low a temperature as possible (40°C.), the product does not keep so well, that is to say, it oxidizes more easily, bleaching it and rendering it tallowy. In fact, during fusion, the anti-oxidant substances of the butter pass into the aqueous part (buttermilk), while with cooking, they can, under certain conditions, pass into the fat and thus augment its keeping quality.

In this case, the factor water is particularly important, as these protective substances are only soluble in cooked butter if it contains very little water, otherwise they absorb the water and become insoluble in the butter. In fact, a butter which has been worked with water aways keeps less well than a butter not brought

into contact with water. When the water content of cooked butter exceeds 0.12 per cent., the anti-oxidant substances which, at a high temperature, passed into the fat, are, during cooling, hydrated by the water, become insoluble in the latter, separate out and are eventually eliminated on filtering.

On studying in detail this passing of the protective substances of the residue into the fat of the cooked butter, RITTER and NUSSBAUMER made the following observations:

About the time when the brown froth begins to form, there is practically no lecithin in the clear liquid fat. Subsequently it starts to pass into the fat. The brown froth is extremely rich in lecithin.

When this brown froth disappears, the proportion of lecithin increases in the limpid fat. The white froth which forms afterwards also contains lecithin, but to a much smaller extent. This lecithin dissolves in the hot fat.

During cooling, a more or less large proportion of the lecithin dissolved in the hot stage again separates out and forms a brown or brownish and even almost white deposit.

The greater the amount of lecithin in the hot fat, the more rapid the precipitation during cooling.

At all events, the higher the temperature at which the fat is cooked, the darker and less easily soluble is the lecithin.

The quantity determinations of phosphorus made by the aforesaid investigators confirm the facts just stated.

Butter fused at a low temperature has practically no lecithin, likewise the first samples taken during cooking after the clarification of the fused fat.

Samples of cooked butter filtered (through paper) at a low temperature contain practically no lecithin or anyhow have less than butter filtered while hot.

Moreover, a certain parallelism was seen between browning due to overheating and the proportion of phosphorus soluble in the fat. Butter cooked very brown always has a high content in phosphatides (lecithin and cephalin).

RITTER and NUSSBAUMER also studied the effect of different *methods of treatment*, in the presence of anti-oxidant substances, on the keeping quality of fused or cooked butter.

Thus various methods can be adopted in cooking butter, applied, besides, to refine other fats and oils and improve the taste, in particular, the elimination of mucilage and the steam treatment (deodorization).

Treatment with ordinary steam, under normal atmospheric pressure, has a detrimental effect on butterfat and, as seen from the studies of the above-mentioned investigators and from those of PATIL and HAMMER carried out on ghee, any treatment of cooked butter which involves the action of water causes the product to deteriorate. The greatest care should be taken so that the final product contains as little water as possible and is not, in any way, brought into contact with water.

Treatment with absorbent substances (animal charcoal, white fuller's earth) exercizes a similar effect to that caused by treatment with water, namely, that it produces a reduction in resistance to oxidation due to the removal of the protective substances which, also, may not be phospholipids.

According to KIEFERLE, investigations on the resistance to oxidation of the product obtained by combined methods bring out the following facts:

After the 1st centrifugal separation, with the afflux of hot water, there takes place independently of the quality of the butter employed, a decrease in the resistance to oxidation (a much higher Lea-Ritter value) compared with samples of butter subjected only to a preliminary clarification.

After the 2nd centrifugal separation without the afflux of water, such a diminution in resistance to oxidation practically never occurs, but generally, strange to say, an increase in this resistance as compared with samples taken from the heating apparatus. KIEFERLE considers that this fact can only be explained by the following hypothesis.

Probably, there are also in animal fats such 'rancidity retarders' so important for the keeping quality of fats, as it has already been possible to demonstrate in the case of vegetable fats and oils. These anti-oxidant or inhibitory substances are probably eliminated by fusion or by centrifugal separation effected with the afflux of hot water. Despite this fact and the reduced resistance to oxidation which it implies, KIEFERLE is in favour of fusion and separation with the afflux of hot water, because in this way the butterfat can be completely purified with the elimination of deterioration principles. As regards the value to be attributed to the presence of these protective substances in fused or cooked butter, SCHULZ and STORCK differ in opinion, as, in using the combined method, they recommend effecting clarification of the liquid fat in a centrifuge without afflux of water, seeing that centrifugation carried out with water reduces the proportion of anti-oxidant substances and the keeping quality of the product.

The effect of the addition of oatmeal also seems to depend on the presence of these elements and on the part they play. With a view to increasing the keeping quality of the product obtained with the combined method, SCHULZ and STORCK carried out a series of experiments using oatmeal and observed the following facts:

The immediate addition of oatmeal at the onset of cooking does not increase resistance to oxidation, probably because the anti-oxidant substances are destroyed on protracted cooking with water.

When after heating of the butter for 15 minutes, 0.5 per cent. oatmeal mixed with water is added and the water subsequently evaporated by boiling, the peroxide percentage fell below 2, even with the worst farm butter.

With dairy-made butter, the addition of oatmeal did not increase resistance to oxidation.

Moreover, the addition of oatmeal is indicated when it is suspected that the quality of the product is impaired by traces of metals (copper, nickel) due to the use of imperfect apparatus and receptacles.

The addition of certain substances to fused or cooked butter to augment its keeping quality is nothing new, as may be seen from p. 436.

3. VITAMIN A AND THE COLOURING MATTER OF BUTTER.

Among the other substances present in butter, particular mention should be made of the colouring matter, the chief components of which are α-carotene and

β-carotene, which represent the preliminary stage of vitamin A and which are found in butter in a fairly high degree.

The presence of vitamin A in ghee plays, particularly in India, an important part from the physiological and nutritional standpoint. There are a fairly large number of studies on the question.

As regards the reduction in vitamin A content caused through heating, SCHEUNERT and WAGNER proved that this content is not diminished by ordinary methods of heating. According to RITTER, there is no difference, in this respect, between fused and cooked butter, as it is only by heating on an open flame above 100°C. that there is some reduction, characterized by discoloration (bleaching) in relation to the destruction of the carotene, as ZECHMEISTER and TUCSON recognize. This discoloration is characterized by the simultaneous appearance of a slight degree of tallowiness.

SHREWSBURY and KRAYBILL considerer that butterfat should naturally contain anti-oxidant substances which protect the carotene and vitamin A against destruction and which can be removed by absorbent substances.

VI. Conservation of clarified butter

Stoneware is the most suitable for containers; these are filled with the clarified butter up to about 2 cm. from the top. To prevent access of air, TEICHERT advocates covering the fused or cooked butter, after solidification, with a layer of cold boiled water to which one or two spoonfuls of kitchen salt have been added, or else to cap the earthenware receptacles with moistened parchment-paper and store them in a cool place.

The clarified butter should be kept away from light and especially from sunlight and stored in the dark. In Switzerland, cooked butter for the market is put into well-plated sheet-iron containers.

Air appears to have little effect, consequently great importance need not be given to the hermetical sealing of the covers as, in the dark, the keeping quality is the same in open as in closed receptacles.

If copper, nickel or iron boilers are used, the keeping quality of the product is reduced. When the butter is of poor quality and the boilers not of the best, it is advisable to add 0.5 per cent. oatmeal before clarification. Cooked butter is less susceptible to the influence of copper than fused butter.

The storage temperature also exercizes some effect. Experiments have shown that after 12 months shop storage, the keeping quality remains fairly even between 5 and 15° C., while between 20 and 25° C., deterioration is more rapid. With long storage at 5°C., there seems to be a tendency to slight tallowiness, more unpleasant than a slight rancidness.

It is on the quality of the original raw butter, however, that the keeping quality of the clarified butter depends. In this respect, there is no essential difference between butter made from fresh cream and that from ripened cream.

Clarified butter prepared from ordinary farm and dairy butter can, according to the quality of the product and method employed, be kept from 3 to 12 months as against 12 to 15 months in the case of a good product obtained from a first grade butter.

SCHULZ and STORCK consider that the butter which keeps best is that which is cooked up to roast taste and already turned brown during cooking.

VII. Valuation of the products

According to TEICHERT, fused or cooked butter should, as an article of trade, meet the following requirements:

(1) The product should, insofar as is possible, consist of pure butterfat. The minimum amount of fat should not be lower than 99.5 per cent. and the proportion of water plus anhydrous non-fatty matter should not exceed 0.5 per cent.

(2) The product should not be too brown in colour, nor have a burnt taste, which can be avoided by not using excessive heating.

(3) The product should not have an offensive odour, nor an acrid taste, due to the poor quality of the original fresh butter (rancid).

(4) The product should not be adulterated by the addition of other fats: margarine, coconut oil, pig fat, or other fats of animal and vegatable origin.

(5) The bacteriological examination should show that it is pure (insofar as regards germ count, acidifying and non-acidifying microbes, proteolytes).

According to KIEFERLE, in evaluating the product, its freshness as expressed from the result of chemical testing did not prove satisfactory, while after organoleptic examination, the result was found irrecusable.

This is why, in Germany, as a standard, the evaluation formulary laid down by the 'Hauptvereinigung der deutschen Milch- und Fettwirtschaft' (German Dairy and Fats Industry Central Association) is employed, association which assigns, as regards organoleptic testing. 20 points distributed between odour, taste, aspect and texture, as follows:

Odour: up to 3 points
Taste: up to 10 points
Aspect: up to 3 points
Texture: up to 4 points.

The best grade of fused or cooked butter, therefore, can obtain 20 points.

VIII. Possibilities of the use of the products

Formerly, the only aim in manufacturing clarified butter was its use as such for human alimentation, but today this scope has widened, even though its original use is still the main one.

In fact there are new possibilities for the use of clarified butter either for regenerating table butter or in cheese-making. Here is the basis of the matter:

(1) In the same way, by mixing sperm oil with vegetable fats, a margarine can be obtained tasting like butter, it should also be possible to regenerate a good table butter from fused or cooked butter, by emulsifying with milk. The cream thus obtained can, in fact, be transformed into butter, giving a higher yield and compensating the loss involved in clarifying.

(2) Preparation of an emulsion with high fat content (called cream of clarified butter) for equalizing the proportion of fat in milk for cheese-making.

With regard to the regeneration of butter, mention should be made of the process described by MARTINY in 1871 and, in particular, of the experiments carried out successfully by PAUL since 1903 following the line, butter → fused butter → butter. They were based on the following processes:

(*a*) Dehydration and fusion. — The butter is fused at a moderate heat (40° to 45° C., but not higher), the liquid fat is then carefully decanted to separate it from the deposit formed at the bottom of the receptacle. Afterwards kitchen salt is heated vigorously in pans on an open fire, left to cool, then introduced, by stirring, into the liquid fused butter, to the amount of 10 per cent. by weight, and there left for 2 to 3 hours continually stirring for several times until all the water is fixed. After this the liquid fat is filtered through cotton in a funnel and the filtrate poured into dark bottles, which are sealed hermetically. During these operations, the fused butter should remain completely fluid, which can be maintained by effecting filtration inside a moderately warm stove pipe. Actually, the fusion and dehydration cause an appreciable loss in fat; but it is only apparent, as the deposit formed by the fused butter may serve for culinary purposes and, on the other hand, the salt can be extracted from the saline residue left after dehydration, so as to recuperate the fat.

The clarified butter obtained with the PAUL process keeps well for at least a year, even at a temperature of about 32° C. It retains the fine odour and taste of the butter from which it was prepared, seeing that, during fusion, the temperature does not exceed 45° C.

(*b*) Regeneration of ordinary butter. — The method employed is as follows: By plunging the afore-mentioned bottles into hot water, the clarified butter is again melted. In double capacity bottles, to 85 parts of this liquid fat are added 15 parts of fresh milk heated at 40° C., and the two liquids are mixed by vigorous shaking for 2 to 3 minutes so as to obtain an emulsion. This is poured in a thin stream into water chilled with pieces of ice or with snow. The emulsion solidifies immediately, forming butter. This is removed from the water by means of a strainer, it is then worked and a product is obtained which has all the requisites of a fine table butter with the taste and odour unchanged.

IX. Yield and profitableness

The yield of fused or cooked butter varies, according to the quality of the original butter, between 75 and 85 per cent. There is an average loss in weight, therefore, of approximately 20 per cent. which, at first sight, seems very high,

on closer examination, however, it is seen that it is composed chiefly of water (up to 14 per cent.) then of a residue which, in turn, can be fully utilized.

Therefore, it cannot be said that it is unprofitable if the loss consists mainly of water, which is eliminated as much as possible as useless ballast. Quite the contrary, besides the better keeping quality obtained, this elimination of water also presents advantages as regards storage and transport expenses, as they are reduced by about 20 per cent., as between the original fresh butter and the clarified butter there is a difference in weight of practically 20 per cent.

Also from the point of view of temperature in storage, the clarified butter is more profitable than ordinary butter, as it can be stored at a temperature above 0° C. (for example 5° C.), while for raw butter a temperature below 0° C. is necessary. Moreover, the latter loses, during storage, 2 to 3 per cent. of its weight through deterioration, without counting the reduction in quality, all of which, naturally, do not come into question in the case of clarified butter.

X. By-products from the manufacture of clarified butter

The by-products from the manufacture of fused butter are, roughly speaking, the same as those of cooked butter, except insofar as regards the colour (lighter) and proportion of phosphatides (higher). The following data regard more particularly the by-product obtained from cooked butter, studied in detail by RITTER and NUSSBAUMER.

(1) Formation. — During the process of cooking, at first there is produced, after fusion, an emulsion of the constituents of buttermilk. Then, with the evaporation of the water, this gradually concentrates and finally solid constituents precipitate in a granular or mucilaginous form. At the time of clarification the residue is still white. It is only subsequently that, with a further careful evaporation of the water, at the same time, the cooked odour and browning of the said residue take place.

On completion of cooking, this brownish residue, generally granular, rarely mucilaginous, is left to settle, then the supernatant limpid liquid fat is drawn off. This only contains small quantities of solid very fine particles of buttermilk, which settle more slowly, and which must be removed by filtering.

By draining the still hot residue through a cloth or else by putting it through a press, the greater part of the fat contained therein can be removed; however there always remains a certain amount of this substance which can only be separated out by means of special methods (hot expression, solvent extraction).

(2) Properties. The residuum left after cooking the butter is a more or less clotted mass, the colour of which varies from light to dark brown. According to its fat and water content, it may also be plastic or nearly doughy. Exposure gradually reduces the water content. When this content is too high, the mass kept in a closed space may become more or less rapidly covered with mould.

(3) Composition. According to W. RITTER and Th. NUSSBAUMER, the residuum contains chiefly the following substances: water, fat, phospha-

tides (lecithin, cephalin and probably sphingomyelin), cholesterol, dry matter (comprising albuminoids, lactose and milk salts, plus small quantities of other constituents soluble in water, such as lactoflavine, etc.).

In the said residuum, the *water content* varies greatly; in general, the greater the degree to which the butter was cooked, the lower it is. RITTER and NUSSBAUMER never found the residuum completely anhydrous; it always contains at least 1 per cent water.

The *fat content* of the residuum is appreciable. Thus even a well drained residuum may easily still contain 30 per cent. fat; this content may be even higher and, in any case, varies considerably.

As characteristic constituents of this residuum, mention should be made of the *phosphatides*, of which it may contain from 5 to 20 per cent. Their absolute quantity as well as the ratio between the phosphatide soluble in alcohol (lecithin) and that which is insoluble (cephalin), vary greatly. The quantities of phosphatides present in the residuum not only depend on those found in the original butter, but also on the conditions under which cooking is effected.

For six different samples of residuum analyzed, RITTER and NUSSBAUMER obtained the following results:

<table>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Fat</td><td>55.0 %</td><td>55.3 %</td><td>42.2 %</td><td rowspan="2">52.7 %</td><td>17.2 %</td><td>36.0 %</td></tr>
<tr><td>Lecithin</td><td rowspan="2">16.2</td><td>3.3</td><td>6.5</td><td>12.9</td><td>7.3</td></tr>
<tr><td>Cephalin</td><td>1.5</td><td>2.9</td><td>6.7</td><td>7.4</td><td>11.1</td></tr>
</table>

In a sample of the residuum in question, REWALD found 9.05 per cent. of total phospatides, comprising 4.52 per cent. lecithin, 3.3 per cent. cephalin and 1,23 per cent. phospatide soluble in hot alcohol, but insoluble in cold alcohol.

The phosphatides obtained are a fairly dark and even brown colour. The reason for this is not known. According to RITTER and NUSSBAUMER, it seems less a question of a marked decomposition of the lecithin, but rather, in the first place, of a substance accompanying the phosphatides (particularly the cephalin as the lecithin can be more easily obtained with a light colour).

The relatively large quantity of milk phosphatides found in the residuum after clarifying butter cannot, however, come from the buttermilk. According to different investigators, ordinary butter contains a certain amount of phosphatides, while, generally, they are not found at all in fused or cooked butter. The studies of RITTER and NUSSBAUMER have also demonstrated that the fat obtained on fusing butter at 42° C. contains no phosphatides. To explain this absence, it must be acknowledged, therefore, that during fusion of the butter, the phosphatides pass entirely into the buttermilk. As regards the phosphatide content of the latter, no data are available, but it may be admitted that after having absorbed all

the phosphatides contained in the butter before fusion, the buttermilk has a percentage of these substances about 7 times greater than their proportion in the raw butter (having 14 per cent. water).

The questions regarding the quantity and condition of the phosphatides in the butter is certainly of great importance from the standpoint of its keeping quality and general behaviour.

As to the form the milk salts take in the residuum left after cooking the butter, nothing is known.

The cholesterol content of the residuum does not appear to be high.

Among its other constituents mention may be made of lactose. Taking as a basis the mode of formation of the said residuum, RITTER and NUSSBAUMER evolved the hypothesis that the lactose is found as anhydride, contrary to the case in the majority of other dairy products, because the β-anydride or β-lactose separate out of solution at temperatures exceeding 93.5°C.

(4) Use of residuum of fused and cooked butter. — Because of the chemical composition and good flavour of these residues, they are utilized best in the kitchen.

They may also be used in animal nutrition. Moreover, the lecithin and fats contained may be recovered by treatment with a fat solvent; in the solution obtained, the lecithin can be precipitated with acetone.

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LIST OF AGRICULTURAL FILMS *

BELGIUM †

FILM TITLE	SUMMARY
La composition florale (*Floral composition*).	The life of various flowers at different times of the year.
West-Vlaanderen met zijn Land en Tuinbouw (*Agriculture and horticulture in West Flanders*).	The beauty of Western Flanders; its agricultural and horticultural wealth; its agricultural industries.

BULGARIA §

Selski-stopanski săbor v grad Varna (*Rural assembly at Varna*).	The assembly was held on August 25, 1936. More than 25,000 peasants, both men and women, were gathered together from the Varna area, all wearing their national costume and bringing with them samples of their crops and other produce.
Grozdoberăt v selo Osmar (*Grape harvest at Osmar*).	Supplement to the above film.
Pod našeto nebe (*Under our skies*).	The son of the village usurer fights the farm co-operative associations; a rural cinema is established in his village, showing the marvellous results obtained by the co-operative associations in several villages. The usurer's son is astonished and disarmed and ends by becoming an enthusiastic partisan of the agricultural co-operative movement.
Petdeset godišnina na părvata bălgarska kooperacia (*The 50th anniversary of the first Bulgarian co-operative association*).	Film showing the ceremonies which took place in the village of Mirkova where the first Bulgarian agricultural co-operative association was founded in 1890 by Todor Tontchev.
Skotovădnitě izložbi prez 1940 godina (*Stock-breeding exhibitions in 1940*). (1) Govedovădnata izložba v Dermanci – Lukovitsko (*The cattle show at Dermanci in the Lukovitsko district*); (2) Konevădnata izložba v Bela-Slatina (*The horse show at Běla-Slatina*); (3) Ovcevădnata izložba v grad Haskovo (*The sheep exhibition at Haskovo*); (4) Nacionalnata pticevădna izložba v Sofija (*The national poultry show at Sofia*).	Cattle, horse, sheep and poultry shows.

* See also this *Bulletin*, 1942 No. 9, pp. 323-347 and No. 10, pp. 372-379.
† Communicated by the *Ministère de l'Agriculture et du Ravitaillement, 2e Direction générale de l'Agriculture et de*

IN THE VARIOUS COUNTRIES *

BELGIUM

Publisher	Producer	Length in metres		Synchro-nized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
State commercial office.	—	332	—	+		1938
Western Flanders Provincial Administration.	—	2300	—		+	1938

BULGARIA

Choumen regional Division.	—	200		+		25-8-1936
—	—	Some dozen metres			+	
General Union of agricultural co-operative associations in Bulgaria.	—	2100			+	1938
»	—	300				end of 1940
Ministry of Agriculture and Crown Lands.	—	1000		+		

l'*Horticulture*, Brussels. — § Communicated from the Ministry of Agriculture and Crown Lands, Economic Section, Sofia.

BULGARIA (*Concluded*)

FILM TITLE	SUMMARY
Obrabotka na lena (*How flax is prepared*).	Processing of flax stems, from retting to spinning the thread.
Obrabotvane natjutjuna (*Tobacco growing*).	4 parts: (1) Production of tobacco in the nurseries; (2) Pricking out tobacco plants; (3) Picking and drying the leaves; (4) Processing the leaves. Abridged edition of the same.
Obrabotvane na pamuka v Bălgarija (*Cotton growing in Bulgaria*).	
Prigotvjane na jagodov pulp (*How strawberry pulp is prepared*).	
Grozdoberăt v Perouštica i rajonnata kooperativna izba « Uspěh » (*The grape harvest at Peronchtitza and the 'Uspel' co-operative cellar*).	The grape harvest; general view of the vineyards in the Kritchim valley; carrying the grapes to the co-operative cellar.
Žetvata na oriza v Plovdivsko (*Rice harvesting in the Plovdiv region*). Official edition.	
Konezavodnata izložba v Šumen (*The horse show at Choumèn*). Official edition.	
Konezavodnata izložba v Plévèn (*The horse show at Plévèn*). Official edition.	2 films; the first shows the exhibition while the second presents the opening ceremonies at the same exhibition.
(Film about bees).	Bulgaro-German film. The life of the bee. Cares and duties of the bee-keeper. Importance of honey both as food and medicine.

DENMARK †

Traek fra dansk Landbrug (*Aspects of Danish agriculture*).	Danish peasants at work.
Statens Ægudvalgs Fjerkraefilm (*Film about poultry prepared by the Egg Committee*).	Poultry rearing in the special centres of the Poultry Breeding Committee; rearing of chickens; disease control; killing poultry.
Æggenes Produktion og Behandling (*Production and handling of eggs*).	Improvement in the quality of eggs; daily work in the hen-run; packing eggs.

† Communicated by the Danish Bureau of the International Institute of Agriculture, Copenhagen.

BULGARIA *(Concluded)*

Publisher	Producer	Length in metres 35 mm. wide	 16 mm. wide	Synchro-nized sound or talking	Silent	Date of release
'Finakoul' Company, Sofia.			170 m.		+	1940
»			236 m. 130 m. 180 m. 153 m. 150 m.		+	1941
»			200 m.		+	1941
»			100 m.		+	1941
			60 m.		+	»
			10 m.		+	»
Division of National Propaganda			20 m. 80 m.		+ +	» »
»		300 m		+		
Centre of Agriculture 'Nectar', Sofia.		800 m			+	1936

DENMARK

'Landbrugsraadet', Copenhagen.	—	—	500 m.		+	June 1938
'Stasens Ægudvalg', Copenhagen.	—	—	225 m.		+	Jan. 1936
»	—	—	225 m.		+	» 1937

DENMARK (*Concluded*)

FILM TITLE	SUMMARY
Kalkuner, Gees og Ænder (*Turkeys, geese and ducks*).	Rearing of turkeys, geese and ducks as practised in Denmark; how the animals are slaughtered.
Hedeselskabets almindelige Virksomhed (*Work of the Association for the cultivation of the moors*).	Afforestation, upkeep of the woods, felling, marling, drainage, regulation of the streams, embanking, building of pumping stations.
Hedeselskabets Leeplantningsvirksomhed (*Planting of windbreaks by the Association for the cultivation of moors*).	Damage caused by wind and sandstorms; right and wrong types of windbreaks.
Fra Forsogslaboratoriets Arbejdsmark. Kvaegforsog (*Activities of the research laboratory. Experiments with cattle*).	The various activities of a research laboratory; experiment farms.
Normal Beslag af venstre Forhov (*Normal method for shoeing the off fore hoof*).	Taking off the old shoe; trimming the hoof and application of the new shoe.
Horren, dens Dyrkning og Behandling (*Cultivation and processing of flax*).	*Part I:* Sowing the flax seed; weed control; pulling up the stems; carrying in the flax; rippling; retting.
	Part II: Crushing the seed; production of oil-cakes and extraction of the oil. Processing of the flax for spinning; manufactured products.
Braendsel fra denske Moser (*Fuel from the Danish peat bogs*).	*Part I:* The peat-bog, its flora and stratification. Various types of peat.
	Part II: Manufacture of briquettes and transformation of former peat-bogs into arable land.
Den danske Skov (*Danish forests*).	*Part I:* Relics of the past in our swamps; development of the forests since 1790; cultivation of the moors and work in the pine plantations.
	Part II: Broad-leaved trees; preparation of the soil; sowings; care of the plants; felling. Various uses of timber.
Fluer (*Flies*).	Harm caused by flies in stables and houses. Various methods adopted in fly control. Phases in the evolution of the house fly.

DENMARK (*Concluded*)

Publisher	Producer	Length in metres		Synchro-nized sound or talking	Silent	Date of release
		35 mm. wide	16 mm. wide			
'Statens Ægudvalg', Copenhagen.	—	—	150 m.		+	Jan. 1938
'Det danske Hedeselskab', Vibarg.	—	450 m.	—		+	
»	—	200 m.	—		+	
—	'Dansk Kultur -film' in collaboration with the Cinematographic Commission.	—	448 m.		+	1939-41
—	»	—	75 m.		+	1939-41
—	»	—	300 m.		+	1939-41
—	'Dansk Kulturfilm'.	—	165 m.		+	1939-40
'Kongsbak og Cohn', Copenhagen.	»	—	410 m.		+	1939-40
'League of Nations, Health Organization'.	—	—	295 m.		+	1939-40

MISCELLANEOUS INFORMATION

How the yield of potato plants is affected by treatment with illuminating gas

The similarity of the action on potato plants of illuminating gas with that of auxines has led to the supposition that it might perhaps be possible to stimulate and increase yields by this means. ZIKA has proved that potatoes could be stimulated and hetero-auxine utilized with complete success. Given the large number of seed potatoes necessary however, this method hardly appeared to be practical, hence the interest in experiments with the application of gas carried out at Brünn in 1940 and 1941 by DOSTÁL * at the suggestion of Prof. O. RICHTER. As early as 1903 the latter was the first to observe the action of illuminating gas on potatoes. Tentative experiments were carried out chiefly in 1940 for the purpose of determining the conditions and duration of the treatment, as well as the concentration of illuminating gas. Experimental work was extended in 1941 and 15 varieties were submitted to treatment with gas in the principal experiment. The 'Sativa' plant selection station at Kerkau (Bohemia-Moravia) supplied the necessary seed potatoes which were extremely healthy and satisfactorily uniform.

The conditions of the main experiment in 1941 were as follows: for each combination comprising the experiment 20 tubers were selected of a shape and size as nearly identical as possible; after being carefully cleaned, they were placed in 10 litre preserve jars and subjected to gas fumes for 24 hours at a temperature varying between 18 and 20° C. The concentrations of illuminating gas were 30, 15 and 7.5 per cent. In the case of 10 varieties, weather conditions made immediate planting impossible, but the tubers were placed instead in the open air in an earth-filled box. The delay in planting amounted to 2 days in the case of 5 varieties and to one day in the case of 5 others while the remaining five were planted immediately after gas treatment.

As compared with the control plants not subjected to treatment, the yields were considerabley increased in the case of 4 varieties, while in the case of the other varieties yields were but little affected or else reduced.

The varieties stimulated were Ackersegen (increase of 102 per cent. after gas treatment at 30 per cent.). Parnassia (increase of 70 per cent. with 7.5 per cent. concentration and of 30.8 per cent. with 15 per cent.), Robinia (19.6 per cent. increase with 7.5 per cent.) and Kerbau Hybrid (82.9 per cent. increase with 7.5 per cent., and of 44.4 per cent. with 15 per cent.).

Treatment with too high a concentration of gas led to a check in the development of the potatoes and reduced the yield of tubers. As is the case when using hormones, success depends upon numerous internal and external factors which have yet to be studied. Despite the resulting variations, the fact remains that potatoes may be stimulated by the use of illuminating gas. This is all the more important because gas treatment is incomparably easier of execution than hormonization, in view of the large quantity of seed potatoes required.

The tubers produced by gas-treated plants often registered the same content in dry matter, ash, starch and vitamin C as did the control tubers. Even when the per-

* DOSTÁL, R., Über die Möglichkeit der Steigerung der Kartoffelernte durch Vorbehandlung des Pflanzgutes mit Leuchtgas. *Bodenkunde und Pflanzenernährung*, Berlin, Band. 28, 1942, Heft. 6, S. 362-382.

centage of these important constituents decreases a little, as in the case of the larger tubers obtained from gas-treated seed potatoes, the absolute quantity is nevertheless higher due to the more abundant crop. Their culinary value is not lowered by the treatment, some of the tubers, such as Parnassia being even improved from many points of view.

A. H.

Cultivation of *Lallemantia iberica* as an oil-producing plant

An oil-producing plant called *Lallemantia iberica*, indigenous to Siberia, Armenia and Iran, is now being cultivated in Yugoslavia. It is found in the wild state in Asia Minor, Syria, Mesopotamia and Transcaucasia, growing as a weed in flax crops. In Russia it is grown near the Black and Caspian Seas, in the districts of Voronesh and Rostov and in the Ukraine. It is an annual herbaceous plant of the Labiatae family, ripening very early and very drought resistent; its blue flowers produce small brown seeds measuring from 4.5 to 5 mm. in length and 1.3 to 1.6 mm. in breadth. These seeds contain a light yellow oil, with a faint odour, quick-drying which is used in the areas where it is produced for the table as well as in the preparation of varnishes and as a burning oil.

The stem of the plant grows to a height of about 50 cm., a characteristic which is against mechanized harvesting but which, on the other hand, gives it greater resistance to wind and lodging.

As regards cultivation the seeds are sown at a depth of 2.5 cm., in rows from 40 to 60 cm. apart, from 4 to 7 kg. being used per hectare. The plant does not require any special care other than that usually given to catch crops. The pods are picked when brown and when the seeds can be heard to move freely inside the pods when shaken. Wheat threshing machines, possibly modified if necessary, are used to separate the seeds.

The principal characteristics of *Lallemantia iberica* oil are the following:—

Density	0.933
Iodine value	162
Saponification value	185-193
Melting point of fatty acids	22°C
Solidification point of fatty acids	11°C.

G. S.

New method of processing the tomato for the production of tomato pulp and 'Vitaminol'

This new process, invented by Vittorio BASSI, an engineer from Piacenza, Italy, differs from other methods of concentration, the sieved tomatoes being worked in the simplest manner. The pulp is obtained by crushing the tomatoes without heating, the seeds and skins being separated from the pulp. The product extracted is treated mechanically, again without heating, till it becomes homogeneous and is then filtered though a special filter press (Patent G. Diefenbach, Monza); this gives two products: tomato pulp on the filter with the required consistency, the nutritive qualities of the fruit remaining unaltered; 'vitaminol', an amber-coloured liquid, with a pleasant odour and taste, containing all the precious qualities of fresh tomatoes, namely, vitamins.

After suitable sterilization, the pulp and the liquid are put into hermetically sealed jars and are ready for use. Vitamin C, which is destroyed by cooking, is thus preserved as also vitamin A, which is partially destroyed, while vitamins B and D are heat resistent.

This process (see *Tecnologia Chimica*, No. 6, 1942), would be extremely valuable in the canning industry as the product loses nothing of its bouquet, savouriness and perfume, at the same time maintaining all its vitamin content.

G. S.

BOOK NOTICES *

CONSOCIAZIONE TURISTICA ITALIANA, *Croazia*. Milano, 1942, 243 pp., 10 carte geografiche e 5 piante di città.

The guide-book to Croatia issued recently by the 'Consociazione Turistica Italiana' (Italian Tourist Association), is not only a work of considerable practical utility for travellers who visit this new State either for business or pleasure, but is also a small historical and economic encyclopaedia capable of arousing the interest of scholars.

There are but few sources of information concerning the new State which was proclaimed on April 10, 1941, unless reference is made to those concerning former Yugoslavia, but it is not always easy for everyone to consult these works. A review of all the activities and resources in Croatia is consequently both timely and useful. The 'Consociazione Turistica Italiana' realized this from the outset and has neglected no means of giving the public a 'synthetic panorama of geographic, demographic and economic conditions in Croatia'; the Association, in collaboration with eminent authorities on the subject, has published a volume filled with information and facts which are not easily found elsewhere and which are presented clearly, and, from the typographical standpoint, in elegant form.

Attention should be called, in particular, to the description of economic and geographic conditions written by Prof. Ferdinando MILONE, of Naples University, who gives a complete panorama of agricultural, forest, trade and industrial conditions throughout the country, with the necessary information concerning geography, geology, climate, demography, etc. Statistical tables and small maps complete his interesting description, which offers quite the best and most up-to-date information available on the subject at the present time. The volume includes the following chapters: General considerations (p. 19)—Geography and geology (p. 20-35)—Climate (p. 36-40)—Demography (p. 57-68)—Agriculture (p. 90-98)—Stockbreeding (p. 98-102)—Forests (p. 102-106)—Mines (p. 106-111)—Industries (p. 111-117)—Communications and trade (p. 117-120).

V. C.

RIKLI MARTIN, *Das Pflanzenkleid der Mittelmeerländer*, Bern, Verlag H. Huber, 1942, 2. Lieferung, S. 120-240. Price: 9, Swiss francs.

Mention was made in the last issue of this *Bulletin* of this new work dealing with the Flora of the Mediterranean countries. The second number, consisting of 112 pages, enables the reader to obtain an even clearer grasp of the author's ideas and his manner of expressing them.

The number under review describes the various plants of agricultural and economic importance, beginning with alfa (*Stipa tenacissima*) esparto (*Lygeum spartum*) and other similar plants belonging to the steppes, valuable in the paper industry. Numerous plants mentioned in the description of natural associations have, however, much more importance from the economic stand-point. Mention should be made, in the first place, of the trees forming stands, and especially those described by the author in the following

* Under this title, reviews are given of books presented to the Library.

chapters: Forest evergreen: cork-oak (*Quercus suber*), holm oak (*Q. ilex*), etc. — deciduous forest trees: American sycamore (*Platanus occidentalis*), Oriental or common plane-tree (*Platanus orientalis*), European turkey oak (*Quercus cerris*), flowering ash (*Fraxinus ornus*), etc. — Resiniferous forest trees: stone-pine (*Pinus pinea*), Aleppo pine (*P. halepensis*), cluster-pine (*P. pinaster*), etc. There are maps showing the area over which all these species are found, while descriptions are given of the methods of cultivation and their uses..

N. G.

REALE ACCADEMIA DEI GEORGOFILI — ENTE ECONOMICO DELL'OLIVICOLTURA, Convegno di studi olivicoli, Firenze, 15-17 maggio 1942-XX, Firenze, Tipografia Editrice Mariano Ricci, 1942, 496 pp. 27 figg., 4 carte, 19 grafici e 37 tav. Prezzo L. 45.

Publication has been completed of the volume concerning the Congress on Olive-growing studies organized by the 'Reale Accademia dei Georgofili' and the Olive-growing Section, held in Florence from May 15 to 17, 1942.

This Bulletin has already published (Nos. 7-8, 1942, pp. 304-307), an account of the Congress and the work accomplished, and we will confine our remarks here to a statement of the publication of the volume containing a full description of the programme, the organization of the Congress, the experts who attended the meetings, the works submitted (reports and communications) as well as the conclusions adopted.

The work of the Congress dealt with four important aspects of the problem concerning olive production: (*a*) botany and parasitology of the olive (3 reports and 5 communications); (*b*) biology and technical methods for the cultivation of the olive (4 reports and 3 communications); (*c*) Elaiotechnique (3 reports and 5 communications) and (*d*) olive oil production and trade (1 report and 1 communication).

The reader will find in this volume the contents of each of these interesting works.

The publication of the volume, as well as the organization of the Congress is due to the initiative of Prof. A. SERPIERI, President of the Royal Academy of 'Georgofili' and Dr. G. PAVONCELLI, President of the Economic Olive-Growing Association ('Ente') and it will undoubtedly arouse keen interest among experts and persons interested in this branch of agriculture who were unable to attend the Congress.

The detailed discussion of the questions studied in the various reports and communications will doubtless have far-reaching effects on the progress of these two important branches of Italian national economy, olive-growing and elaeotechnique.

E. M. DE B.

NEW PERIODICALS RECEIVED BY THE LIBRARY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE for the fourth quarter of 1942 (*).

BALGARSKO zemedelsko droujestvo, Sofia. Архивъ на българското земедѣлско дружество. Животновъдство. София, v. 1 (1941)—, irr. [Headings and summaries also in German. Title also in German: Archiv der Bulgarischen landwirtschaftlichen Gesellschaft. Tierzucht.]

BALGARSKO zemedelsko droujestvo, Sofia. Архивъ на българското земедѣлско дружество. Земедѣлие. София, v. 1 (1942)—, [Headings and summaries also in German. Title also in German: Archiv der Bulgarischen landwirtschaftlichen Gesellschaft. Pflanzenbau.]

(*) *List of abbreviations:* bihebd. (biweekly); bimens. (twice monthly); bimestr. (every two months); déc. (every ten days); étr. (foreign price); fasc. (copy); hebd. (weekly); int. (home price); irr. (irregular); mens. (monthly); n° (number); N. S. (new series); p. a. (per annum); q. (daily); sem. (half yearly); s. (series); trihebd. (every three weeks); v. (volume); trim. (quarterly).

N. B. — Between brackets [/] are given translations and explanatory notes not appearing in the title of the periodical.

BALGARSKO zemedelsko droujestvo Sofia. Архивъ на българското земедѣлско дружество. Земедѣлска икономия. София, v. 1 (1942)—, irr., [Headings and summaries also in German. Title also in German: Archiv der Bulgarischen landwirtschaftlichen. Gesellschaft. Wirtschaftliche Probleme der Landwirtschaft.]

DOBOVÉ spisky Matice lesnické. Pisek, Matice lesnické, v. 1 (1933)—, trim. 18 K. p. v. [Bulletin of current information of the Central organization of Czech foresters].

DOMENICA de « Il lavoro fascista ». Roma, v. 3 (1942)—, hebd. L. 12.— int.; L. 35.— étr.

SEMI oleosi; bollettino mensile dell'Associazione nazionale coltivatori piante erbacee oleaginose. Roma, v. 2 (1942)—, mens.

TECNICA agricola; rivista internazionale, organo della Federazione internazionale, dei tecnici agricoli (F. I. T. A.), Roma, v. 12 (1942)—, trim. L. 25. — int.; L. 35.— étr. [Contents also in German. The articles in French, Spanish and English are with German or Italian translations or summaries. Die Landwirtschaftstechnik.] [Continues: : La Technique agricole internationale].

TYGODNIK rolniczy, Zichenau. Königsberg (Pr), Reichsnährstand Verlags-Ges. m. b. H. Zweigniederlassung Ostpreussen, v. 1 (1942)—, hebd. RM. 6.72. [The title of the articles also in German and occasionally the text also in German. The title of the review also in German: Landwirtschaftliches Wochenblatt für Zichenau].

SCHRIFTTUM aus dem Gebiet des Pflanzenbaues und der Pflanzenzüchtung für den Reichsverband der Pflanzenzucht zusammengestellt im Schrifttumsamt des Forschungsdienstes. [Berlin-Dahlem]. nº 1 (1939)—, irr.

SCHWEIZERISCHE Zeitschrift für Biochemie. Bern, v. 1 (1941/42)—, mens. Fr. 25.— [Original articles are in German, English, French or Italian].

Prof. UGO PAPI, *Segretario generale dell'Istituto, Direttore responsabile.*

STABILIMENTI TIPOGRAFICI CARLO COLOMBO — ROMA, 20 GENNAIO 1943.

PLANT PROTECTION

INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

ITALY.

San José Scale Infestation †

Following the discovery of slight infestations of the San José scale (*Aspidiotus perniciosus*) in two orchards of the Provinces of Verona and Padua in 1940, the Italian Government, by Ministerial Decree of December 20, 1940, declared the control of scale insects of fruit trees compulsory. Control measures were energetically put into operation using 7 per cent. mineral oil emulsions during winter; however, despite this treatment, in the spring of 1941, traces of infestation were found in the same orchards and in three others in the aforesaid provinces; a small focus was also reported in the Province of Lucca.

For this reason, more severe measures were immediately taken for compulsory control which was also extended to nursery products by Ministerial Decree of February 15, 1941.

Some traces of infestation, however, having continued here and there in the three provinces mentioned, the Italian Government denounces, conformably to the International Convention for Plant Protection signed at Rome on April 16, 1929, the presence of the San José scale in the three Provinces of Lucca, Padua and Verona, and communicates having made compulsory, since December 1940, the control of this insect by means of 7 per cent. mineral oil emulsions, the efficacy of which on fruit crops has been recognized, and has decreed, as a precautionary measure, the disinfection of all nursery products by means of hydrocyanic acid gas fumigation.

To ensure security, these compulsory measures have been applied to all the provinces of Northern and Central Italy.

* Under this and the next heading the countries are arranged in French alphabetical order.

† Communication from the Ministry of Agriculture and Forests, Rome to the International Institute of Agriculture.

SWITZERLAND.

Colorado Beetle Situation in 1941 *

Owing to the mild weather in April, 1941, the adult hibernating Colorado beetles (*Leptinotarsa decemlineata*) came out very early in regions with a favourable climate (April 26 at Cugy, Fribourg Canton; May 1 at Aesch, Basel-Land Canton; May 2 at Genève; May 12 at Clarmont, Vaud Canton, etc.) On the whole, there was not much sign of the beetle in the foci of the previous years.

The cold rains during May slowed down the coming out of the insects, scarcely begun, up to the end of May and the beginning of June. Adult beetles in any considerable number were only observed about mid June. It was at this time that the first ovipositions started. From mid June the temperature was high, as much as 30°C. and even over in many districts. During this period, it was found that the tendency to swarming was very strong. In fact, the western wind again brought entire swarms of beetles from the neighbouring French territory. Western Switzerland was invaded by many thousands of these indesirable visitors. They spread throughout the land even finding out secluded potato fields in the valleys of the Jura. Consequently there was a rapid and considerable increase in the number of beetles discovered.

The maximum number of foci of larvae was reported in the period from July 6 to 15 in Western Switzerland to mid July in Northern, Central and Eastern Switzerland.

The first nymphs were found during the third week of July, the first adults of the summer generation in the fourth week of the same month. The month of July, warm and dry, provided optimum conditions for the development of all stages of the Colorado beetle.

The potato producing centres at the foot of the Jura, in the cantons of Solothurn, Basel-Land and Aargau were especially affected.

Thanks to the effectual working of the Colorado Beetle Control Service damage was not severe. The invasion, however, has shown the farmers that it is a more serious danger than they formerly supposed. The first ovipositions of the second generation were observed from the first week of August. Spraying was found to be very efficacious in destroying the pest. The number of new foci reported, instead of increasing as was expected, soon began to diminish. Many eggs and young larvae were destroyed owing to the cool and damp weather during August and September. At higher altitudes, there were early frosts.

The surviving adults soon hibernated in the ground. Only one generation developed in the mountain cantons. The cool nights slowed down the evolution of the different stages of the insect.

* Communication from Dr F. T. WAHLEN, Director of the Federal Establishment for Agricultural Experiments, Zürich-Oerlikon, Switzerland.

This pest was reported for the first time in the following cantons, until now unaffected: Uri (Altdorf, June 29: eggs and young larvae), Appenzell A.-Rh. (Herisau, July 5: adults) and Nidwalden (Hergiswil, July 10: larvae).

To date, no focus has been found in the cantons of Graubünden and Ticino.

The following table indicates the situation as found at the end of 1941:—

	Cantons	Communes	Foci
German Switzerland	Zürich	150	1,317
	Bern (excluding Jura)	323	8,535
	Luzern	105	1,866
	Uri	1	2
	Schwyz	14	40
	Obwalden	4	16
	Nidwalden	6	57
	Glarus	5	7
	Zug	10	107
	Solothurn	124	2,809
	Basel-Stadt	3	251
	Basel-Land	73	2,557
	Schaffhaussen	30	491
	Appenzell-A.-Rh.	4	8
	Appenzell-I.-Rh.	2	3
	St.-Gallen	46	270
	Aargau	224	5,544
	Thurgau	57	89
	Total	1,181	23,969
French Switzerland	Genève	45	*
	Vaud	370	*
	Neuchâtel	62	*
	Bern (Bernese Jura)	146	*
	Fribourg	214	2,697
	Valais	19	179
	Total	856	Invasion widespread with the exception of Valais and Fribourg Cantons
	All Switzerland	2,037	Invasion widespread

* No exact figures; infestation being general and beetles found in practically all fields grown to potatoes.

The map given on p. 105 indicates the distribution of the Colorado beetle in the different districts. The pest proceeded throughout the length of the valleys and flew over the passes being carried along by the western winds which pre-

cede the storms. Since the first invasion of Switzerland, infestation has advanced as follows:—

Year	German Switzerland		French Switzerland		Entire country	
	Communes	Foci	Communes	Foci	Communes	Foci
1937	2	2	118	411	120	413
1938	314	895	513	approx. 3,600	827	approx. 4,500
1939	686	4,355	845	approx. 33,000	1,531	approx. 38,000
1940	732	8,774	586	Invasion widespread	1,318	Invasion widespread
1941	1,181	23,969	856	Invasion widespread	2,037	Invasion widespread

The number of communes contaminated has increased by 719 for the whole country. The figure for the foci reported in German Switzerland shows an increase of 200 per cent. (from 8774 to 23,969). The increase was particularly pronounced in the centres of Bern, Luzern, Schwyz, Obwalden, Nidwalden, Zug, St. Gallen and Thurgau. All the communes contaminated are in the canton of Genève, Neuchâtel and the Bernese Jura and for the greater part in the cantons of Vaud and Fribourg.

It is very satisfactory that in the canton of Schaffhaussen the number of foci have been reduced to half that of the preceding year. It is true that the swarms from outside were less considerable, but it should be noted, on the other hand, that spraying carried out with ordinary hand pumps or with motor pumps reduced the extent of infestation appreciably. This proves that if the control measures advocated are conscientiously and scrupulously executed, the chances of success are high. Control was effected according to the well known international rules. The collaboration of the Colorado Beetle Control Commission, the Federal Establishments for Agricultural Experiments of Lausanne (Mont Calme) and Zürich-Oerlikon and the cantonal and communal centres again proved to be very effectual.

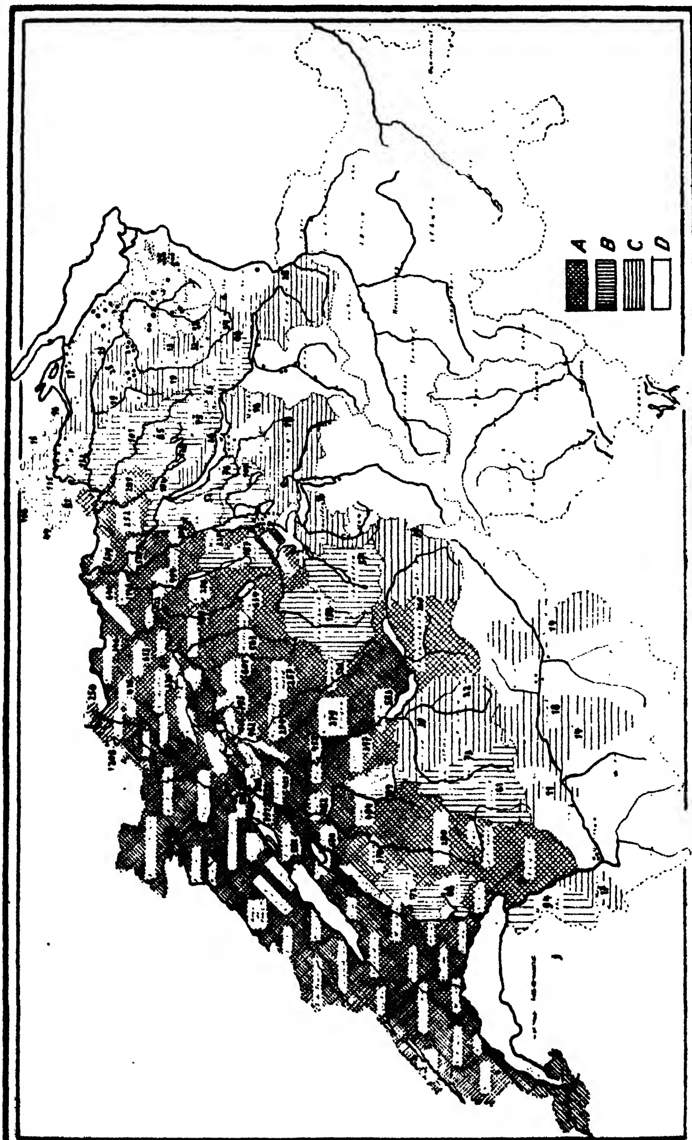
In the future, special attention will have to be given to the following points:—

(1) Instruction on effectual and rational control must be given to every potato grower.

(2) The communal authorities should give particular attention to the periodical inspection of fields. The systematical examination of all potato fields in a commune encounters special difficulty in war-time owing to shortage of labour; this must be overcome by making greater use of students, boy scouts and other associations for the young. It is a work which should be considered as an indispensable 'civil service'.

(3) The Geigy chemical works at Basel has produced a preparation of organic nature, without arsenic, which is very efficacious, at the same time being harmless to warm-blooded animals. This insecticide is not affected by

air or light, and acts either through contact or by ingestion. It has a particularly high adhesive capacity which makes it especially valuable for small



Map (scale 1/600,000) prepared by the Federal Bureau of Statistics.

A = Districts with over 200 foci

B = ... with 50 – 199 ..

C = ... with 10 – 49 ..

D = ... with less than 10 ..

scale growers who thus have a control product of prolonged efficacy to use as a dust; they will be able to control the Colorado beetle in their plots more effectually and more simply than was formerly the case with the rotenone dusts,

which, while being momentarily very effective, were rapidly modified through the action of rain and light, so that treatment had to be repeated and consequently was expensive. Moreover, this new preparation is equally effectual against many fruit, viticultural and agricultural crops, a fact which will rapidly make it popular.

(4) The danger of the Colorado beetle must neither be exaggerated nor underestimated. Its advance and its dissemination make it necessary, in the invaded regions, to effect regular treatment and to organize collection on all potato fields. We are in the fortunate position of still having, for next year, a sufficient quantity of products for dusting, thus making it possible to avoid serious losses through the Colorado beetle.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — A Decree of March 31, 1942 extends blackbird hunting, during the 1942-43 shooting season, up to January 31, 1943. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Mai 1942, 22. Jahrg., Nr. 5, S. 36).

⁂ Ministerial Provision dated April 13, 1942, with a view to preventing the introduction of the carnation leaf roller (*Tortrix pronubana*), establishes that consignments of carnations (cut flowers) from Denmark and the Netherlands imported during the period from May 1 to November 15, 1942, must be accompanied by a certificate of origin. (*Ibid.*).

⁂ The Station for research on the Colorado beetle (*Leptinotarsa decemlineata*) at Kruft [see this *Bulletin*, 1941, No. 1, p. 7 and Nos. 7-8, p. 141] has again recommenced activities as from April 16, 1942. (*Ibid.* S. 35).

⁂ The new list of communes contaminated by grape phylloxera [*Dactylosphaera vitifolii*] and of suspected communes and those in danger of being infected was published in the 17th number of the *Reichsministerialblatt der Landwirtschaftlichen Verwaltung* on April 25, 1942. (*Ibid.*, S. 36).

⁂ A list has been published of the vareieties of potatoes resistant to wart disease [*Synchytrium endobioticum*], according to the Decree dated October 8, 1937 [see this *Bulletin*, 1938, No. 2, pp, 28-29] relative to the control of this disease. (*Ibid.*, Anfang Juni 1942, Nr. 6, S. [37]-38).

Belgium. — The first and second lists have been published of the products definitively agreed upon by the Department of Agriculture and Supplies by virtue of Article 2 of the Decree dated October 15, 1941 [see this *Bulletin*, 1941, No. 12, p. 225] regulating the sale of insecticides, fungicides, weedicides and other parasiticides. (*Moniteur belge*, Bruxelles, 4 février 1942, nº 35, p. 713-714; 30 mai 1942, nº 150, p. 3529).

Denmark. — Decree No. 31 of January 19, 1942 modifies the Decree dated February 28, 1941 relative to the toxic substances utilized in the control of plant diseases and pests. (*Lovtidenden A.*, København, 13 Febr. 1942, Nr. 4, Sid. 41)

Spain. — By Decree of May 11, 1942, the National Institute of Parasitology subordinate to the Upper Board of Scientific Research, has been established at Granada.

This Institute is charged with research work and the study of parasitological questions in general and different subjects, particularly those regarding Spain, North Morocco and the Colonies; the creation and maintenance of suitable collections and the training of specialists.

The National Institute of Parasitology will be in relation with the different Services which for similar purposes are in operation at the General Departments of Morocco, the Colonies and Public Health.

The Upper Board of Scientific Research will organize the new Institute intended to replace the Section of Helminthology and Parasitology established by the Board at the University of Granada. (*Boletín Oficial del Estado*, Madrid, 24 de mayo de 1942, año VII, núm. 144, pág. 3634 y 3635).

France. — Law No. 473 of April 6, 1942 supplements Articles 12 and 29 and modifies Article 19 of Law No. 1318 dated March 25, 1941 regarding the organization of plant protection [see this *Bulletin*, 1941, No. 10, p. 188]. (*Journal officiel de l'Etat français*, Vichy, 11 avril 1942, LXXIVème anée, nº 87, p. 1369).

Italy. — By Ministerial Decree of October 14, 1941, the Royal Observatory for plant diseases at Pisa is divided into two separate sections, the one specializing in plant pathology and the other in agricultural entomology. Their circumscription comprises the Provinces of Pisa, Livorno and Grosseto. (*Bollettino Ufficiale del Ministero dell'Agricoltura e delle Foreste*, Roma, 1-11 maggio 1942, anno XIV, n. 13-14, pp. 647-648).

⁂ Ministerial Circular No. 236 of February 24, 1942 requests the provincial Commissariats for plant diseases to report without delay to the phytopathological Observatory of their district the appearance of plant pests and diseases. (*Ibid.*, 21 marzo-1º aprile 1942, n. 9-10, p. 455).

⁂ A Ministerial Decree dated March 15, 1942 declares compulsory the control of broom-rapes of tobacco and legumes [*Orobanche* spp.] in the territory of the Province of Benevento by collecting and destroying these parasitic plants. *Ibid.*, 11-12 aprile 1942, n. 11-12, pp. 563 564).

⁂ Ministerial Circular No. 255 dated March 17, 1942, establishes the modalities to be followed in the organization of locust control. (*Ibid.*, pp. 586-590).

*** Ministerial Circular No. 256 of the same date contains the measures to be observed for the marketing of anticryptogamic products. (*Ibid.*, p. 594).

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INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

GERMANY.

The Colorado Beetle (*Leptinotarsa decemlineata*) in 1941 †

The Colorado beetle infested zone was approximately the same as in 1940. The beetle, in its different stages of development, was reported, during the year 1941, in 164 municipal and rural districts (174 in 1940), and in 3250 communes.

The cool weather during April and the first half of May delayed the appearance of the hibernating adults; in fact they only began to come out of the ground after mid May. The maximum development of the larvae took place during the period from mid June to after the second decade of July, period during which the temperature was highest.

The adults of the new generation began to appear during the first decade of the month of July. The second larval generation was observed from mid July; on the whole, however, it does not seem to have attained full development. An astonishing fact was that already during the first decade of August, the adults of the new generation ceased feeding and started burrowing into the ground. In fact, with the exception of certain relatively warm localities, where up to the beginning of October some isolated adult beetles still appeared, the parasite, during the first half of September, began to disappear from the fields.

The first adult beetle reported resulted, from ploughing operations, at Worms on April 4. The first adult beetle attacking plants as also the first egg masses were observed on May 14 at St Wendel. The first larvae were found on June 1 in three different districts of the Lahr district (Kippenheimweiler, Mahlberg and Orschweier). The first nymphs were reported on June 23 at Besseringen (Merzig District), the first adult beetles of the new generation at Saarburg on July 1. Finally, the ultimate adults were observed during the first days of October.

Conformably from the previsions made from the observations of the preceding year, contamination was intense in Baden, Westmark and in Hesse. Despite an advance made by this pest, the total number of foci reported in the region of North Moselle was much less than expected. On the other hand, infestation,

* Under this and the next heading the countries are arranged in French alphabetical order.

† Communication from the 'Biologische Reichsanstalt für Land- und Forstwirtschaft', Berlin-Dahlem, Germany, official correspondent of the Institute.

in intensity and density, was appalling in Alsace and Lorraine, newly incorporated, as well as in the district of Malmedy. Infestation was also very severe in some parts of Luxemburg. However, in consequence of the immediate measures taken and effective spraying operations, the Colorado beetle was held in check and no damage was caused. It was even possible to prevent all losses in the infested centres of Lorraine where, the previous year, the fields had been completely devastated by this pest. An extension of the invaded zone towards the east has again been successfully checked. The control organized by the military authorities in the eastern departments of occupied France, where the Colorado beetle situation was no less serious than in Lorraine, has had a decisive effect. In this way, not only have appreciable economic losses been avoided, but the danger of invasion menacing German territory has also been considerably reduced.

FINLAND.

Eriophyes tulipae, as an Onion Parasite *

In October, 1937, W. B. Carter found in Sacramento, California, on the bulb scales of *Tulipa* a mite which was described the following year by Keifer under the name of *Eriophyes tulipae*. This mite was very probably introduced from the Netherlands. In fact Keifer writes: 'The bulbs are said to have originated in Holland'.

At the beginning of May, 1942, Dr A. Vaarama presented me with some onions (*Allium cepa* L.) taken from the School of Horticulture at Lepaa which were attacked by a species of *Eriophyes*. During storage at the School, these onions had developed some leaves 3 to 5 cm. long on which the mites appeared, in parts, like a white floury dust. The parasite was found to be identical with *E. tulipae* Keifer.

It was not possible to ascertain the origin of the onions, but it was soon established that the mite was also found on onions at Helsinki and that all the consignments of infested onions came from the same plant breeder in southern Finland. The plant breeder in question declared that, several years previously, he had imported the basic material from which he had developed his own special type of onion from the Netherlands.

This mite causes severe damage to onions which are soon completely destroyed by moulds. All the onions attacked which I had occasion to observe were incapable of developing. At Lepaa losses were estimated at approximately 30 per cent.

The severe attack of the parasite appears rather astounding. As it is possible, however, that the mites breed in March-April or even throughout the winter, it is understandable that their number may already be considerable in May.

As yet nothing is known as regards control measures.

* Communication from the official correspondent of the Institute, Prof. Dr J. I. Liro, Phytopathological Institute of the University, Helsinki, Finland.

LIBYA.

Experiments for Controlling the Olive Fly in Tripolitania with the De Luca Method *

The research work with the control method of De Luca against the olive fly (*Dacus oleæ*), began by myself in 1938 in Libya—the method was tried out in 1937 also against the Mediterranean fruit fly (*Ceratitis capitata*)—were continued in 1939-40-41.

In July, 1938, I followed, on behalf of the Libyan Government, the official experiments which were carried out for the Ministry of Agriculture and Forests in the territory of Francavilla Fontana, in Apulia, with the method and formula made known by Sig. Ignazio De Luca.

As soon as I returned to Libya, in September, I carried out the first spraying on five olive plants (local variety 'Scemlali') with a mixture of the following composition:—

Water	100	litres
Iron sulphate	2.5	kg.
Calcium polysulphide, 35° Baumé	4	litres
Solid creoline	0.5	kg.
Milk of lime . . . approximately	5	litres

enough to obtain a slightly alkaline reaction.

At the time of treatment (September 18), the olives very abundant on the five plants selected, were infested by the fly to the extent of 12.6 per cent. on an average and very still far from the ripening stage.

Spraying was effected with an ordinary pressure pump, provided with an extension injection pipe and a spray jet; all the crown of each tree was properly soaked both inside and out, taking particular care to thoroughly cover the drupes with the liquid.

While the spray was still wet, the plants treated remained a black colour, subsequently becoming greyish and finally a rust colour. Both the drupes and the other parts of the plant invested by the mixture presented a closely adhering patina which, however, was easily rubbed off with the fingers.

While it resisted sufficiently well to fairly heavy rain, always in the relative sense, this patina, on the contrary, was removed, particularly in the top parts of the crown, in consequence of the friction caused at every breath of wind.

Owing to this disadvantage, I was obliged to spray again on October 5 three of the five plants under treatment, not until after taking samples of the olives on which I found an average infestation of 14.3 per cent.

* Communication from Dr Giuseppe M. Martelli, Assistant Director at the Agricultural and Zootechnical Experiment Centre of Libya, Chief of the Section of Agricultural Entomology and Zoology, Tripoli, Libya.

If the quantity of liquid employed in the first spraying was 70-90 litres for each plant (which had an average diameter of five metres of crown projection and a height of six metres), in the second, it was appreciably lower (30-45 litres), because it was sufficient to renew wetting those parts of the plant where the patina had been removed through the wind.

Further taking of samples, effected on October 20, showed that, while infestation remained constant in the three plants subjected to the double treatment, it had increased to 17 per cent. in the plants treated only once and up to 48.9 per cent. in the nearby control plants. At this date, the olives of these last plants had to a large extent become blackish, while, on the plants under treatment, on the contrary, practically all the fruits were still green. At the beginning of November, during harvesting of the olives, I again calculated percentage of infestation: the control plants showed an infestation of 88 per cent., those treated twice within limits not exceeding 15 per cent. and finally those treated once only, 22-25 per cent.

Harvesting ended at the beginning of December; the last samples gave the following percentages of infestation:—

Control olives	100	per cent.
Olives treated once	32.9	» »
Olives treated twice	16.6	» »

The increases in infestation from the period of the first treatment up to the time of harvesting were respectively 87.70 per cent., 20.6 per cent. and 4 per cent.

I took care not to have the olives of a large branch of one of the control trees and those of a large branch of a tree treated twice collected.

In the second decade of January, 1939, all the olives of the control plants had fallen, while the greater part of those of the plant treated twice were turgid, glossy, firmly attached to the peduncle and for the greater part still free from *Dacus* infestation. They were entirely destroyed, however, in the days that followed through the voracity of the birds. In regard to yield in oil, yield which for evident reasons cannot be established on equivalent weight, but on equivalent number of treated and non-treated olives, exceeding satisfactory results were obtained; with a Soxhlet extractor the former gave a yield of 16.2 per cent. and the latter 12.7 per cent.

In view of the fact that the different substances constituting the mixture might affect the quality of the oil, I caused to be crushed, without preliminary washing, several kilograms of olives treated twice in a small special press. It clearly appeared, however, both from the organoleptic and the chemical examination (even only as regards acidity), that the oil obtained was very fine, having an acidity not higher than 1 per cent., without any peculiar flavour, extraneous odours, while the oil extracted from control olives attained an acidity of 4-5 per cent.

Encouraged by the results of these first experiments, I carried out another, in 1939, on table olives. In this case, I employed a Vermorel motor pump with which I sprayed 12 olive plants belonging to different varieties not all exactly identified.

No substantial modifications were made in the formula and I limited myself to reducing slightly the percentages of iron sulphate and calcium polysulphide which proved excessive for the purpose in view.

The first spraying took place on June 4, namely as soon as I observed the first punctures of *Dacus* on the olives. On June 10, the control plants, including some of varieties very susceptible to the olive fly, presented an infestation which attained 90 per cent., while the treated olives were quite sound. On June 20, many of the drupes being entirely or partially uncovered owing to their size and the disappearance of the patina through the wind, I carried out a second spraying which was sufficient up to time of harvesting. At that time (first decade of September), the fruits of the control plants presented, for some varieties, an infestation of 100 per cent., while those of the treated plants, belonging to the same varieties, showed a maximum infestation of 8 per cent.; these latter were also slightly late in maturing and presented, in consequence, a development proportionately inferior to the control olives so that, to eliminate bitterness, it was necessary to delay harvesting for some twelve days.

Storage tests carried out with these olives gave completely favourable results, as after over a year, they had an appearance and flavour entirely similar to those of the olives from the control plants.

Both with the experiments of 1938 and those of 1939, no apparent consequence was observed, except a slightly accentuated fall of the old leaves; moreover, the treated plants emanated, for a long time, a slight odour of sulphur dioxide until the autumn rains washed off the greater part of the patina. On the other hand, the smell of creoline disappeared after a few days.

In 1940 and 1941, owing to war conditions, I limited myself to small scale experiments on portions of the crown of some plants, employing much more simple mixtures, such as:—

(1)	Water	100	litres
	Milk of lime	25	»
	Soap	1	kg.
(2)	Water	100	litres
	Calcium polysulphide	1	»
	Milk of lime	10	»
(3)	Water	100	litres
	Milk of lime	25	»
	Solid creoline	0.5	»
(4)	Water	100	litres
	Milk of lime	25	»
	Powdered clay	2	kg.
	Soap	0.2	»
(5)	Water	100	litres
	Milk of lime	25	»
	Fuller's earth	2	kg.

Although the results obtained with some of these formulae were encouraging, I do not think them worth taking into consideration, partly because the exiguity of the experiments carried out do not make for trustworthy judgment.

From the experiments on the whole, the fact remains that the control method of De Luca is worth an attentive and close study.

The solution of the problems connected with this method, such as the use of considerable quantities of water and the improvement of the formulae to make them simple and economic, in particular by good adhesives and soaking material, in place of creoline and soap, should be the aim of our experimenters who will take example from the efforts accomplished in some forty years by our best scientists in combatting one of the greatest scourges of agriculture.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — An Amendment dated April 1, 1942 modifies the general provisions of March 7, 1938 regulating seed testing [see this *Bulletin*, 1938, No. 7, p. 150]. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Juni 1942, 22. Jahrg., Nr. 6, S. 42).

*** By Decree of April 30, 1942 the control of the Plant Protection Service passes within the competency of the administrative powers of the Reich Farmers' Leader (' Reichsbauernführer'). Each agricultural administrative district (' Landesbauernschaft' corresponding approximately to the domain of a province) is provided with a Division from the Plant Protection Service which in turn may, on authorization of the ' Reichsbauernführer ' detach regional and specalized branches like the dozen already in operation in different parts of the country. (*Ibid.*, S. 41).

Spain. — An ' Orden' dated July 11, 1942 contains the instructions relative to the organization of the anti-locust campaign. (*Boletín Oficial del Estado*, Madrid, 16 de julio de 1942, año VII, núm. 197, pág. 5187).

Italy. — The Ministerial Circular No. 268 of April 1, 1942 authorizes the wine-growers desirous of trying out fungicides not containing copper in the control of downy mildew of the vine [*Plasmopara viticola*] to carry out this testing under certain conditions and, in particular, at their own risk. (*Bollettino Ufficiale del Ministero dell'Agricoltura e delle Foreste*, 1-11 maggio 1942, anno XIV, n. 13-14, pp. 667-668).

*** Ministerial Circular No. 269 dated April 7, 1942, regulates the distribution of chemical fertilizers and fungicides. (*Ibid.*, pp. 669-670).

*** Ministerial Circulars Nos. 275 and 276 of April 14, 1942 refer to the control of the sparrow with a view to protecting the wheat crop. (*Ibid.*, pp. 672-673).

*** Two Ministerial Decrees, dated June 6, 1942, declare compulsory in the territory of the provinces of Ravenna and Forli the control of beet tortoise beetles (*Cassidula vittata* and *C. nobilis*) by dusting with calcium arsenate, spraying with lead arsenate preparations, trap plants as well as by other methods to be indicated by the Royal Observatory of Phytopathology at Bologna.*

Morocco (French Zone). — A Vizirial Decree of June 10, 1942 (25 joumada I 1361) orders, *inter alia*, that consignments of tomatoes, eggplants or potatoes intended for or having to pass through the French Zone of the Sherifian Empire, may only be effected if new packing material is employed.

As a temporary measure, for the duration of hostilities, the Plant Protection Inspector may authorize the importation of these plant products in used packs, if he considers that there is no danger in doing so. He may prescribe in this case any sanitary measure he deems necessary, such as putting into packs of Moroccan material at the import port or frontier post.

The importer is required to furnish proof of the exact origin and place of cultivation of the potatoes, tomatoes or eggplants imported.

The expedition of potatoes: (*a*) from fields in the territory of the countries invaded by the Colorado beetle (*Leptinotarsa decemlineata* Say and *L. multitaeniata* Stål); (*b*) or having passed in transit through these countries, by any route whatsoever; (*c*) or taken from fields situated in the regions bordering invaded countries, when the Colorado beetle has been reported at less than 50 km. from the frontier, should have been made conformably with the following provisions:

The tubers should have been cleaned and packed at the port where loaded and not at any other place. These operations should have been carried out under the actual supervision of an officer of the Plant Protection Service of the country of origin or transit.

The tubers may have been cleaned by the wet or dry method and under conditions enably the soil to be removed as well as any other substance adhering to the tubers or mixed among them.

When the sanitary inspection effected at the entry to the French Zone of the Sherifian Empire indicates that cleaning was not carried out or was insufficient, the consignment is refused.

The packing and handling of the cleaned tubers should have been carried out with new sacks, covers, cloth, cases, casks, baskets, etc. and in premises separate from those in which cleaning was effected.

The packs prepared according to the instructions prescribed above should have been immediately sealed in the presence of the officers who supervised the aforesaid operations indicated.

Consignments of potatoes to which either paragraphs (*a*), (*b*) or (*c*) refer, must be accompanied by a certificate conformably with the example attached to this Decree. This certificate which should testify that the tubers have been

* Communication from the Ministry of Agriculture and Forests, Rome, Italy, to the International Institute of Agriculture.

cleaned and packed and the packs sealed in the presence of the officer who signs and according to the requisite conditions, should indicate the characteristics enabling the identification of the consignment.

These provisions, excepting those regarding cleaning, are applicable to tomatoes and eggplants: (*a*) from crops grown in the territory of countries invaded by the Colorado beetle; (*b*) or having passed in transit through the territory of these countries, by any route whatsoever; (*c*) or originating from fields situated in the territory of the regions bordering invaded countries, when the Colorado beetle has been reported less than 50 km. from the frontier.

Consignments of potatoes, tomatoes and eggplants which come under the case of paragraphs (*a*), (*b*) or (*c*) are only authorized for importation when the Governments of the countries in question have supplied the Sherifian Government with the names and signatures of the officers appointed for the supervision prescribed at the ports, as well as a copy of the seals.

The import in the French Zone and the transit through this zone of potatoes, tomatoes and eggplants in bulk are prohibited; quantities of not more than 10 kg. may be allowed entry unpacked.

Consignments of potatoes, tomatoes and eggplants comprising packs not conformable to the prescriptions of this Decree may be returned in their entirety.

The application of the prescriptions of this Decree is made without prejudice to those of the provisions of the Dahir of September 20, 1927 (23 rebia I 1346) regulating the plant sanitary policy and the Decrees taken in the application of this text.

The Vizirial Decree of August 1, 1936 (12 joumada II 1355) [see this *Bulletin*, 1936, No. 10, p. 227] relative to the application of the sanitary measures regarding potatoes, tomatoes and eggplants on their entry into the French Zone of the Sherifian Empire is repealed. (*Bulletin Official*, Rabat, 10 juillet 1942, XXXIème année, nº 1550, p. 579-580).

Portugal. — 'Portaria' No. 10.054 dated March 24, 1942 regulates the distribution of copper sulphate available for the treatment of vines as well as that of other copper fungicides. (*Diário do Gôverno*, Lisboa, 24 de Março de 1942, Iª Série, num. 68, págs. 266-267).

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⁂ Ministerial Decision No. 2.195 dated February 5, 1942 commissions the technical staff authorized by the Division of Wine-growing and Horticulture, to take samples of all the insecticides and fungicides at establishments, drugshops, pharmacies, etc. who manufacture or sell these products, in order to carry out a re-examination of them. (*Ibid.*, 9 Februarie 1942, Nr. 33, pag. 878).

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INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

SPAIN.

Forest Pathology Notes †

Among the diseases studied, during the first semester of 1942, at the Fungi and Plant Pathology Laboratory of the Forestry Institute for Research and Experiments, Madrid, the following, owing to their phytopathological importance, stand out:

A defoliation of replantings of *Pinus insignis* Dougl. in the Province of Guipuzcoa. — This defoliation which, in some cases, led to the dying off of entire groves, was caused chiefly by *Naemacyclus niveus* Sacc., *Septoria acicola* Sacc. and *Diplodia acicola* Sacc. (the last two species are new to Spain). The treatment of nurseries and replantings with the German product ' Motz ' (based on polymers of formaldehyde) has not yet been tried owing to import difficulties due to the war.

A disease of poplar groves (*Populus nigra* var. *fastigiata* Poir.) 5 to 7 years old, in the Burgos Province. — The branches and boughs of the poplars wither and sometimes many young trees die-off. This disease is caused by *Dothiorella populnea* Thüm., a species new to Spain the mycelium of which develops in the living part of the bark. The stromata of the parasite are found fairly frequently on branches measuring 1 cm. and less in size, associated with the saprophytic species *Coniothecium radians* Sacc. the mycelium of which lives in the rhytidome. As a preventive measure, spraying the healthy branches with 5 per cent. Bordeaux mixture is being tried, after pruning and burning all diseased branches.

A disorder of beeches in some forests of the Navarra Province. — This disorder, in Spain caused principally by *Hypoxylon coccineum* Bulliard, *Bispora monilioides* and *Schizophyllum commune*, and known in Germany under the names of ' Stocken ', ' Verstocken ', ' Buchenstockfäule '. ' Ersticken ' and ' Vermücken ', is due to the difficulty in clearing away the wood in these forests, as the cut and disbarked beeches have to remain for a certain period on the ground in the forest. At present, an endeavour is being made, as a preventive measure, to protect the exposed part of the timber by applying a 15 per cent. solution of zinc chloride.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Communication from Sr. José Benito Martinez, Forest Engineer, Director of the Fungi and Plant Pathology Laboratory, Forestry Institute for Research and Experiments, Madrid, transmitted by the official correspondent of the International Institute of Agriculture, Sr. José del Cañizo, Agricultural Engineer, Bachelor of Natural Science, Central Station of Plant Pathology, Madrid, Spain.

SWITZERLAND.

Progress of the Colorado Beetle, *Leptinotarsa decemlineata*, in the Country *

Situation on June 1, 1942.

Emergence from the ground of winter adults began fairly early this year. Already on April 21, a half a dozen insects were captured at Cressier, Neuchâtel and, the next day, several were found at Aïre, Genève. In both cases, it is probable that tilling operations brought the insects to the surface and roused them. Normal emergence, in fact, only began at mid May: May 19 at Aigle, Chavannes-des-Bois, Vaud and Collombey Muraz, Valais. Mass appearances were reported after May 20, when light showers moistened the soil. On May 27, at Chavornay, adults were found still in the ground despite the great heat of that day (approximately 27°C. in the shade). As usual emergence was spread over several weeks.

It is still too soon to give an exact report of the situation which develops rapidly from day to day. The reports secured on June 1, however, make it possible to form an idea of the infestation of the cantons at that date.

At Genève, since May 20 an abnormal abundance of perfect insects, either scattered or assembled together, has been noticed, chiefly in the environs of Aïre, Troinex, Praille and Meyrin (up to 200-300 per 100 sq. metres at the French frontier). Other regions, in compensation, are less contaminated. The first ovipositions were reported from May 20 onwards and hatchings towards the end of the month.

In the Vaud canton, an abundant emergence was observed in the district of Nyon and the Orbe Plain. Isolated insects were captured to a small extent everywhere except in the Gros de Vaud and Jorat. On June 1, over 60 communes had reported discoveries and, from May 22, ovipositions became more and more numerous. The first larvae were found on May 25 in the Orbe Plain, at Allaman and Saint Sulpice. Several communes have already ordered general scouting and collection of the insects.

In the canton of Fribourg, the first discoveries were also made beginning from mid May. The districts of the Broye and the Lake are infested in a scattered manner; insects are reported at different parts here and there. In the rest of the canton, infestation is as yet very weak. In Gruyère only one insect was discovered.

In Neuchâtel, despite the first very early discovery, mass emergence did not really occur until the middle of May. The commune of Cortaillod reports a very heavy infestation of nearly all the potato fields and hatching of larvae from May 25 onwards. The other communes at the Pied du Jura such as Landeron, Saint Blaise, Bevaix, now appear to be attacked. In the intermediate valleys, where moreover, the potatoes were harvested very late, there is nothing to report except that at Couvet 20 adult insects have been captured.

* Communication from the Federal Station for Experiments and Seed Control, Lausanne (Mont Calme), Switzerland.

In the Bernese Jura, some insects were noted on May 3. It is only since May 20, however, that they became more and more numerous, especially at the bottom of the sunniest valleys.

Valais, although affected since May 19, this year, as yet, appears to be infested but very slightly.

In German Switzerland, the following cantons have reported captures: Zürich, Bern, Luzern, Schwyz, Obwalden, Zug, Solothurn, Basel-Stadt, Basel-Land, Schaffhaussen and Argau. Solothurn, Luzern, Bern, Basel-Land and Argau appeared to be attacked the most.

* * *

As is seen the new control campaign starts in force. Infestation of the potato crops is high at the Pied du Jura, from Genève to Zürich. The weather abnormally hot for the time, favours and accelerates greatly the development of the Colorado beetle. Moreover, the winds from the West prevail. They are accompanied by sudden storms which will probably bring across the Jura, as was the case in previous years, numerous adult insectes. It is necessary, therefore, to be prepared for a very strenuous compaign.

The organization of compulsory control, which has given proof of its value for the last five years, remains in force as before. The Federal Commission for the control of the Colorado beetle, assisted by the Federal Agricultural Experiment Stations, already during the winter, has issued general instructions and assured the necessary financial means. The cantonal Commissioners commissioned with the execution of the measures prescribed had already met in March and made their arrangements for ensuring in thier cantons, with the assistance of the cantonal agents, an active protection of all potato crops. Thanks to wise foresight, the necessary insecticides are available in sufficient quantities. It is advisable, however, to economize in their use. To this end, operations will be carried out in patches, that is, treatment will be limited to the foci and the immediate surroundings according to the directions of the communal agent. The insecticides will again be supplied by the Confederation at a reduced price lower than wholesale purchase cost, but, however, slightly higher than that of last year owing to the increased cost of the raw materials.

When the stocks of diplumbic arsenate will be exhausted, the communal agents will furnish calcium arsenate in powder for washes. The experiments carried out for the last three years at the Federal Stations have, in fact, proved that calcium arsenate, much cheaper than the diplumbic compound, is very efficacious if well prepared. The Federal Commission, on the basis of these results, requested, as long ago as two years, Swiss manufacturers to equip their factories for the production of this arsenate, today an accomplished fact. The experiments of Federal Agricultural Stations also proved last year that a synthetic insecticide discovered at a Swiss factory is very effective against the Colorado beetle and against various other parasites. This insecticide, since called ' Gésarol ', acts by contact and by ingestion. This year it will be tested over larger areas. If its value is confirmed, it will be of great service as, not being poisonous for man and

warm-blooded animals, it will be able to be employed in the place of arsenates and even as a substitute for rotenone dusts which become difficult to import and which are, however, necessary for small plantings with other vegetables.

General school scoutings will soon be ordered. They have, in fact, been found indispensable as they make it possible to collect many insects, to determine within a short time the actual extent of infestation and thus to decree at an opportune moment the compulsory treatments.

VARIOUS QUESTIONS

Action of Contact of Different Metals on the Development of Neoplasms by *Bacterium tumefaciens* *

In the course of earlier research on the influence at a distance of metals on the neoplasms caused by *Bacterium tumefaciens* Smith et Townsend, it was possible to establish that the metals, at a distance of 15 or 20 cm. from the branch inoculated with the bacterium, acted as an excitant on the growth of the pathological tissues developing in consequence of the bacterial inoculation [1].

The metal, acting at a distance (through the air) exercizes a biological action on all the young tissues; but on the pathological meristems the stimulating action of growth is singularly more effectual than that exerced on the normal meristems of the same plant species, in other words, that the pathological meristem tissues prove much more susceptible that the normal meristem tissues to the action of metal at a distance. It has not yet been fully explained what, in these experiments, is the mechanism of the action of the metal, namely, of what nature is the stimulating or, in some cases, depressive cause which provokes these evident biological facts, but it is possible to formulate hypotheses based on present physico-chemical and biological knowledge.

Among the hypotheses I proposed for the interpretation of the biological effects ascertained I recall the following:—

(*a*) The stimulating biological agent of growth could be constituted by the exhalations which, in minimum doses, are actually emitted from metallic surfaces; this interpretation, however, is not definitely justified by the results of some experiments, and is in opposition with the results of other experiments as, for example, those which prove the lowering effects from a distance.

(*b*) The metal would act as a secondary radiator of the permanent cosmic radiation and the biological effects should be attributed to the secondary radiation, ' sciami ' or ' Schauer ' determined particularly by lead, when this latter is affected by cosmic radiation. The biological influence of metals would be, in this hypothesis, due to these ' Schauer ' or to the ionization of the air, which is produced in an environment traversed by these corpuscles. The fact that these

* Communication from Professor VINCENZO RIVERA, Director of the Plant Pathology Institute, University of Perugia, Italy.

'Schauer' have a biological effect is proved by recent experiments, in which the action of the metal is exersized through very thin plates of glass or quartz [2].

It may be acknowledged that in an experiment of this kind, the metal influences the living matter through the action of several factors, namely, that it may have a multiple action; it must be admitted, however, that the biological effects verified depend directly or indirectly on the secondary radiation of the cosmic radiation. The statements, therefore, open up a wide field of study and interpretation of biological facts, and the presence of metals in the living tissues of animal and plant organisms stand out as a fact so closely bound up with life that it would have been difficult to imagine it before these experiments.

In the biological action of penetrating radiation and in the biological action of metals at a distance — group of new facts only recently come to the knowledge of scientists [3] — a general interest is discovered from the fact that the action of metals has an influence on animal and on plant tissues, and a special interest through the influence the metal exercizes on the pathological tissues of the two kingdoms.

The plant pathologist, more easily than the human pathologist — and the plant more clearly than the animal organism with its tissues constituted in a complex manner can show — have the possibility of setting the terms of this interesting problem.

What, however, is the behaviour of pathological plant tissues in regard to the metal placed in contact with them?

At the Institute of Plant Pathology, University of Perugia, Dr C. Sempio has already shown, by experiments carried out on different species of fungi and, in particular, on *Thielavia basicola* Zopf, that between the action at a distance and action by contact of metals on the living organism, no parallelism of effects is found [4].

This want of parallelism, while offering some data on the question of the physical agent determining the biological effects recalled, tends to increase the knowledge on the susceptibility of the plant pathological meristems in respect of the different metallic treatments compared. It is undoubtedly useful, in effect, to experiment on these meristems which are the most susceptible to contact action by the same metals.

Therefore research was turned to the development of neoplasmic masses due to *Bact. tumefaciens* on *Pelargonium zonale*, by applying, immediately after the inoculation of the bacterium, a metal lamina on the surface of the incision made for inoculation and on which a pure culture of the bacterium had been spread. For the inoculation a part of the plant in active growth was selected, such as the region immediately below the apex; an opening was made in the form of a buttonhole, namely a longitudinel incision right through the stem, with a scalpel capable of piercing it through and through, taking care that the openings on both sides were the same size and the surfaces as equal as possible. In the opening thus made, after having smeared the two edges of the wound with a pure culture of the bacterium, a strip of metal, cut in such a way as to occupy practically the entire space of the opening, was introduced. In the control plants, in place of the

Zinc

Copper

Lead

Glass

Fig. 1-4. — The geraniums were inoculated with a pure culture of *Bacterium tumefaciens* and in the opening made by incision a lamina of zinc, copper, lead or glass (control) was introduced. The zinc prevented the formation of any trace whatsoever of tumour on the surface of the the cut with which it was in contact and on the other surface checked the the development of the neoplasmic tissue as soon as, in developing, it came into contact with the zinc; the copper did not prevent, not even at the points where it was in contact with the tissues, the formation of the tumour, but it reduced growth more so than did lead. The differences are clearly seen on comparison with the control plant, where glass was inserted instead of a metal.

The inoculation of the bacterium and the introduction of metals into the wound were carried out on January 24, 1938; the photographs were taken on March 16, 1938.

metal strip, a lamina of glass, which we consider as relatively inert to the tissues and to the pathogenic bacterium, was inserted.

Evidently, it was not possible to obtain nor to maintain an absolute adhesion between the metal and the surfaces of the cut on which the bacterium had been

Fig. 5. — The initial action, slightly depressing of the lead on contact, soon disappeared, to give place to a sharply stimulating action of the neoplasmic tissues which surrounded and enclosed the lead inserted in the wound: this leads to suppose that, in this phase of the experiment, the lead influences the tissues in development by a mechanism of the type of that put into effect by the metal in its action from a distance.

spread; however, in the parts not adhering to the metal, contact was subsequently effected through the intermediary of the neoplasmic tissues in process of development.

These experiments have, in short, given a result definitely positive, all the metals tried showing, from the very beginning of the tests, a depressing action on the development of the pathological growths, although to a degree varying appreciably according to the metal used.

The strongest depression of the development of the bacterial tumour was obtained in the inoculations covered with zinc laminae, while only a very slight depression was noted with lead and an intermediary development with copper. In every case, the neoplasmic masses appeared in the first phase of the experiment, inferior to those obtained in the controls with glass; subsequently, however, the tumours which developed on contact with lead, especially some where very thin strips of lead had been used, attained and even exceeded the development of the controls with glass.

The beginning of the development of tumours of *Bact. tumefaciens* on *Pelargonium*, therefore, is weakened appreciably by contact of the pathological meristemal tissues with copper and especially with zinc, while contact with lead determines at first a slight depression of the development of the tumour and subsequently

causes a stimulation, in comparison with the development of the tumours on the control plants. The biological effects of the metals acting by contact on the plant pathological meristems, therefore, are accomplished with effects contrary to those produced by the same metals when these act at a distance on the bacterial neoplasms: in this case, maximum and durable stimulating effects are obtained with lead, while zinc and copper manifest effects much inferior and differing little from each other, so that one may speak of a certain parallelism between the atomic weight of the metal and its biological action. On the contrary, in the case of metal in contact, considerable and lasting biological effects (depressants of the development of the tumour) are obtained, precisely in the case of copper and especially zinc, while the slight depression exercized by lead on the tissues formng the tumour is followed by a very evident stimulating impulse on these latter.

These results confirm in the first place that the action exercized on the living matter by the metal by contact is of a different nature to that excercized at a distance. In the experiments just described, the action of the metal is not effected through space but, on the contrary, on account of the sap expre sed by the wound made in the tissues of the plant in order to introduce the parasitic bacterium. It may be thought that this sap, in view of its acidity, determines reactions of the metal which are not produced in the open air, and that the products of this reaction are toxic for the plant cells: this toxicity, which is slight or nil for the metal having an effective stimulating action on living matter when acting from a distance, is, on the contrary, very high for metals which, like zinc, exercize from a distance a minimum biological action.

The distinctions that we have made since the beginning of these experiments between the different biological actions of metals, brought into evidence by ourselves and confirmed in Italy and abroad (as was recalled in the previously cited successive reports), find a happy illustration in this experimentation: in fact, while the inhibitive action of zinc is maintained throughout the duration of the experiment, the depressing action of lead is afterwards transformed into a stimulating action of the neoplasm, which leads to suppose that the action of contact, so little efficacious on tumours in formation, should give place to an action of the type exercized by the metal at a distance. As for zinc, does the inhibitory action regard exclusively or principally the multiplication of the bacterium or, on the contrary, that of the cells of the host? In this case, does the action of the metal or of its compounds prevent the cellular multiplication of the cell become tumorous because of the action of the bacterium or, on the contrary, is it the transformation of the normal meristemal cells into tumorous cells which is prevented?

Further experimentation will make it possible to answer these questions.

It should also be added that the toxicity of zinc salts, up to the present employed very little in plant pathology, have shown, in these experiments and in others in course, good promise for the control of plant parasites.

In conclusion, it should be recognized, in this complex experimentation, that lead has a prevailing capacity of action on living matter at a distance and that zinc has a prevailing capacity of action by contact. Bacterial tumours of plants may be considered as being particularly adapted for disclosing and estimating these biological effects.

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LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — A Decree of April 25, 1942 extends to the occupied parts of Carinthia and Carniola the provisions of the Decrees of November 21, 1939, January 19, July 27 and August 17, 1940 relative to the control of the San José scale [*Aspidiotus perniciosus*] [see this *Bulletin*, 1940, No. 5, p. 103; No. 6, p. 123 and No. 12, p. 240 respectively]. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, Juli 1942, Bd. XIV, Nr. 3, S. 78).

⁂ A Decree, dated May 17, 1942, modifies the raising of carrier-pigeons The prohibition, *inter alia*, against keeping carrier-pigeons in a zone six km. distant from the frontier, is repealed. (*Nachrichtensblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Juli 1942, 22. Jahrg., Nr. 7, S. 48).

⁂ By Decree of May 22, 1942, the importation of carnation slips from Denamark is authorized provided that the establishments of the growers are subjected to permanent phytosanitary control, that the consignments are

accompanied by an official certificate of health and origin and that on inspection on entry into Germany no symptom is found of the presence of disease or pests, in particular, the carnation leaf roller [*Tortrix pronubana*]. (*Ibid.*).

*** A communication transmitted to the press and published June 3, 1942, recalls to those concerned that the provisions in force allow the proprietors and usufructuaries of enclosed land to kill and appropriate wild rabbits without a permit. The use of rifles, however, is only allowed by means of special authorization. Snares and poison bait for destroying rabbits are prohibited. (*Ibid.*).

Germany (Protectorate of Bohemia and Moravia). — A Notification of the Minister of Agriculture and Forests, dated May 26, 1942, renders compulsory the disinfection of wheat, rye, barley and oats seed. The Ministry will publish a list of the means suitable for disinfecting the different cereals.

The communes are required to install a common disinfection centre as soon as necessary. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Juli 1942, Bd. XIV, Nr. 3, S. 81-82).

*** A Notification of the Minister of Agriculture and Forests, dated April 28, 1942, prescribes the phytosanitary inspection of deciduous fruit and ornamental plants, as well as the living parts of these plants intended for reproduction before being dispatched to Germany. Dispatch will only be authorized if the result of inspection is favourable. (*Ibid.*, S. 79-80).

Germany (Prussia). — By Decree of March 26, 1942, the Decree dated April 16, 1941 regarding the control of the strawberry beetle (*Rhynchites germanicus*) [see this *Bulletin*, 1941, N°. 10, p. 188] continues in force for another year, namely. up to March 31, 1943, in certain communes of the district of Wiesbaden. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Juli 1942, Bd. XIV, Nr. 3, S. 76).

*** A Decree of April 10, 1942 requires growers in Heswig Holstein to destroy the ' Raspglanzkäfer ' [*Meligethes aeneus*] attacking their rape and turnip crops, by following the rules established for the purpose by the Plant Protection Service (see this *Bulletin*, 1941, Nos. 7-8, p. 143]. (*Ibid.*, S. 77).

*** By Decree of April 17, 1942, it is prohibited, in certain districts of Pomerania, to use for potato cultivation seed potatoes taken from crops which have been recognized as severely affected by virus disease. (*Ibid.*, S. 76-77).

Germany (Lower Styria). — By virtue of the Decree of June 11, 1942, the regulation of the trade in poisons, including the means of control against plant diseases and pests, is adapted to the provisions in force in the Reich. *Inter alia*, the Decree of August 28, 1941 regulating the sale of control preparations containing thallium [see this *Bulletin*, 1941, No. 12, p. 223] will also be applied to the territory in question. (*Nachrichtenblatt für den Deutschen Pflanzenschutzedienst*, Berlin, Anfang August 1942, 22. Jahrg., Nr. 8, S. 54).

*** By Decree dated June 17, 1942, the provisions relative to the control of the San José scale [*Aspidiotus perniciosus*] adopted in Carinthia and in Carniola by the Decree of April 25, 1942 [see p. 141] are also put into force in Lower Styria.

Furthermore the former Austrian provisions of July 15, 1882 aiming at preventing the introduction of grape phylloxera [*Dactylosphaera vitifolii*] through international trade will also be applied. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Juli 1942, Bd. XIV, Nr. 3, S. 78-79).

France. — By Law No. 810 of August 26, 1942 the syndical associations for permanent crop protection charged by the Law of March 25, 1941 [see this *Bulletin*, 1941, No. 10, p. 188) to organize, on a local basis, plant protection, are henceforth denominated: ' Groupements de défense permanente contre les ennemis des cultures '.

These ' groupements ' are constituted according to the Law of March 21, 1884, modified by the Law of March 12, 1920. (*Journal officiel de l'Etat français*, Vichy, 1er septembre 1942, LXXIVème année, nº 209, p. 2986).

Hungary. — The Royal Legation of Hungary at Rome has forwarded to the International Institute of Agriculture a list of the signatures of the experts authorized, for 1942, to sign the certificates issued by the Phytosanitary Service of the Kingdom of Hungary.

Italy. — Ministerial Circular No. 300 of May 20, 1942 modifies Ministerial Circular No. 255 of March 17, 1942 [see this *Bulletin*, 1942, Nos. 7-8, p. 107] relative to the organization of locust control. (*Bollettino Ufficiale del Ministero dell'Agricoltura e delle Foreste*. Roma, 21 giugno-1º luglio 1942, anno XIV, nn. 18-19, p. 985).

*** Ministerial Circular No. 302, dated May 21, 1942, referring to Ministerial Circular No. 268 of April 1, 1942 [see this *Bulletin*, 1942, No. 9, p. 122] regards the assembling of all useful information relative to experiments made by private winegrowers with preparations not containing copper or with new products having a reduced copper content. (*Ibid.*, p. 986).

*** Ministerial Circular No. 307, dated June 2, 1942, contains directions for the use of products to be employed in the control of downy mildew of the vine [*Plasmopara viticola*]. (*Ibid.*, 11 luglio 1942, n. 20, pp. 1131-1132).

*** Ministerial Circular No. 316 of June 16, 1942 deals with the measures suitable for preventing the damage caused by game by the use of poisons in agriculture. (*Ibid.*, pp. 1136-1137).

*** Royal Decree No. 980 of July 17, 1942 relative to the organization of the departments of the Ministry of Agriculture and Forests in the territories recently annexed to the Kingdom of Italy lays down, *inter alia*, that branches specialized in plant protection, subordinate to the provincial Inspectorates of Agriculture, may be created in accordance with Art. 26 of Royal Decree No. 489 of May 29, 1942 [see this *Bulletin* 1941, No. 9, pp. 165-166].

With this end in view the total of the said branches provided for by the abovementioned Article is increased to seventy-two. (*Gazzetta Ufficiale del Regno d'Italia*, Roma 9 settembre 1942, anno 83°, n. 212, pp. 3732-3733).

*** By Ministerial Decree of July 30, 1942, the importation into Sardinia of plants and parts of plants including fruits and seed from other regions of Italy is authorized solely through the ports of Cagliari and Olbia after phytosanitary inspection to be carried out by the Royal Observatory of Phytopathology for Sardinia.

The aforesaid plant products should be accompanied by a certificate of health and origin testifying that they are free from dangerous and easily spread animal and plant pests and, in particular, from *Laspeyresia* [*Cydia*] *molesta*, *Iridomyrmex humilis*, *Ceroplastes sinensis*, *Deuterophoma tracheiphila*, *Blepharospora* [*Phytophthora*] *cambivora* and *Graphium ulmi*. (*Ibid.*, 19 agosto 1942, n. 194, p. 3401).

*** A Ministerial Decree, dated July 31, 1942, establishes the modalities for the import from abroad, by way of exception, of potatoes intended exclusively for planting for the 1942-43 crop season.

The importation of tubers taken from crops affected by virus diseases or from a locality infested by *Doryphora* [*Leptinotarsa*] *decemlineata*, *Synchytrium endobioticum*, *Phthorimaea operculella*, *Heterodera rostochiensis*, *Epitrix cucumeris* and other pests not allowed by ths control organizations of the producing countries, is prohibited. (*Ibid.*, 11 agosto 1942, n. 188, pp. 3327-3329).

Rumania. — Ministerial Decision No. 5.195 dated March 12, 1942 gives, in French and Rumanian, the list of experts deputed to sign the phytosanitary certificates which have to accompany consignments of agricultural products sent from Rumania, together with the facsimile of their respective signatures. (*Monitorul Oficial* (Partea I), București, 20 Iunie 1942, Anul CX, Nr. 141, pag. 5086-5087).

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INTERNATIONAL BULLETIN
OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

ITALY.

Animal Parasites of Cotton †

The cultivation of cotton, introduced into Italy by the Arabs round about 850, attained its maximum extent (hundred thousand hectares) during the Continental System and the American War of Secession; subsequently outside competition and the want of technical improvements led to a decline in this crop which remained restricted to Sicily, chiefly in the Gela Plain, Province of Caltanisetta and the coastal zone of Sciacca, Agrigento Province. Cultivation started to revive in 1935 because of the sanctions. In 1941, approximately 65,000 hectares were grown to cotton in Sicily and about 15,000 in Southern Italy.

In the absence, in general, of a rational cultivation technique and pest control, the crops do not give the unit production which the environmental conditions would make it possible to obtain.

In this communication I report the results of the research work and observations effected in 1941 in the different Italian cotton-growing regions.

I. Animal parasites:—

(a) *Armadillidium cinereum* and *A. badium* (Crustacea). Harmful to young plants, the roots and collar of which are gnawed.

(b) *Tetranychus telarius* (Acarina). Harmful to crops, causing red patches. Often brings about defoliation of the plants.

(c) *Thrips tabaci* (Thysanoptera). Punctures leaves causing the formation of lineal marks of a silver-grecy or lead colour along the nervures on the under surface. This coloration may spread to almost the entire limb. The Stoneville variety is very susceptible to attack by this insect, the continuation of which is facilitated by the abundant crop trash left on the field.

* Under this and the next heading the countries are arranged in French alphabetical order.

† Communication from Prof. GIUSEPPE RUSSO, Director of the University Institute of Agricultural Entomology and Director of the Phytopathological Observatory (Entomological Section), Pisa, Italy.

(d) *Nezara viridula, Carpocoris purpureipennis, Dolycoris baccarum* and *Spilostethus pandurus* (Hemiptera). Harmful because of punctures to the unripe bolls in which they suck they seed, frequently causing non-formation.

(e) *Empoasca decedens, E. decipiens* and *E. libyca.* Puncture the leaves causing first yellowing in patches on the under surface (July-August) and subsequently reddening on the upper surface followed by defoliation. The *Empoasca* are very harmful especially when the plants have a luxuriant growth as is the case in fresh soil, the use of nitrogenous fertilizers and with closely grown, irrigated crops. The median and basilar leaves are the most attacked. The Acala variety is affected very severely under these conditions; the Stoneville variety less so, and the Biancavilla and Biancorizzo varieties still less. *E. decedens* is the most commonly found species; the other two are observed somewhat rarely.

(f) *Bemisia tabaci.* Harmful in the larval state chiefly to the leaves at the apex of the plant, causing by its punctures, punctiform patches yellow in colour on the under surface and dark red on the upper surface. When in large numbers the excrement bring about the development of sooty blotch. This insect is always more harmful to irrigated crops, especially if the plants are not properly spaced.

(g) *Aphis (Doralis) frangulae.* Noxious in its different forms and stages, especially to crops with luxuriant vegetation, causing the curling of the shoots and shrivelling of the young leaves. If in large numbers, it promotes the development of sooty blotch. Moist atmosphere favours their development. The damage is nearly always appreciable, particularly if timely control measures are not taken. Among its most common predators, I observed the beetles *Coccinella 7-punctata, Adalia bipunctata, Subcocinella 24-punctata,* the lace-wing *Chrysopa carnea* (=*C. vulgaris*) and the fly *Xanthandrus comtus.*

(h) *Agrotis segetum* (Lepidoptera). The caterpillars are harmful in cool zones to young plants, the roots or basal part of the tigella of which may be gnawn, causing wilting followed by the dying-off the plant.

(i) *Heliothis armigera.* The caterpillars attack the flowers, the young bolls—causing shedding— and the older bolls, eating the seed, particularly in fields situated in the neighbourhood of gardens.

(j) *Caradrina exigua.* Its caterpillars can cause damage to crops by eating the leaves.

(k) *Earias insulana.* The caterpillars injure the young shoots through boring, or the squares or young bolls inducing shedding, or the more fully grown bolls, consuming the seeds.

(l) *Crocidosema plebeiana.* The caterpillars of this species tunnel the shoots and gnaw the young bolls.

(m) *Platyedra gossypiella.* The pink bollworm which is the most noxious insect pest of cotton. The caterpillars devour the seeds, check the development of the lint and are an indirect cause of modification of the fibre through the second-

ary action of bacteria and fungi. In infested zones, 25-50 per cent. of the crop is damaged. The introduction of the pink bollworm is relatively recent (1925) and is due to the negligence of an experimenter with non-disinfected seed of the Acala variety. Cotton-growers encourage their multiplication by letting infested bolls remain on the fields. The absence of wire netting in the windows of private storehouses as also of the warehouses of the provincial agricultural associations favour the spread of this moth. The caterpillars of the pink bollworm are parasitized by a species of Hymenoptera, *Pimpla roborator*, to the extent of 3 to 5 per cent. In view of its importance in the biological control of *Pl. gossypiella*, the study of its natural enemies will be continued.

(n) *Pentodon punctatus* (Coleoptera). Injurious in the adult stage to young plants, chiefly the collar being eroded.

(o) *Agriotes lineatus*. Harmful in the larval stage, destroying the cotyledons of the planted seed, the young tap-root and the part of the tigella in the ground thus causing, particularly in fresh and moist soils, an appreciable thinning out of the crop making re-sowing frequent with all its consequences.

II. Reddening of leaves.

This is a serious pathological manifestation of cotton crops in Italy which greatly injures growth and affects yield. According to the studies and observations I have made in various regions of the country, distinction should be made between the different manifestations of reddening due to different causes and the disorder should be considered as an unique pathological manifestation. The following forms may be distinguished.

(a) Marginal reddening of the leaf, always occuring on both surfaces of the leaf and of a purple red colour. This reddening is generally limited to the marginal part of the leaf, but may also subsequently spread over the entire leaf. It may be considered as being of physiological nature and due to excessive moisture of ground situated in a humid zone or given numerous irrigations, especially in soils to which nitrogenous fertilizer has been applied. The leaves at the base and the middle are those most affected.

(b) Reddening in patches all over the upper surface of the leaves, light red in colour and corresponding to a yellowing of the under surface due to the punctures of larvae, nymphs and adults of *Empoasca decedens*, *E. decipiens* and *E. libyca*. The patches are irregular and more or less extensive and lying between the main nervures, which remain green as well as the part of the lamina which borders them. The leaves of the middle part of the part are those chiefly affected, the leaves of the lower part less so, and the terminal leaves but rarely. The punctures of *Empoasca*, as also those of other leaf-sucking insects and of *Tetranychus* induce the disappearance of the chlorophyll; the plant reacts by forming anthocyanin pigments which give the red colour to the leaves. According to the degree of the disorder, the leaves reduce or cease their chlorophyll function and the result is that the plants do not develop normally, lose their leaves, causing shedding of the squares and the young bolls. The bolls left on the plant

do not attain full maturity and the seeds do not ripen (making them unsuitable for planting) and the fibre is shorter and weaker. Cotton crops in humid zones or where irrigation is excessive are severely attacked by *Empoasca* spp. In general, marginal and patch reddening occur contemporarily.

(c) Reddening in patches at the base of the principal nervures and corresponding to a yellowing of the lower surface, due to colonies of *Tetranychus telarius*. Subsequently the reddened surfaces that, in the case of heavy infestation, are also observed on the rest of the leaf become greyish yellow, the leaves wither and die.

(d) Punctiform reddening on the upper surface of the leaves, violaceous in colour and corresponding to yellow patches on the under surface, due to punctures of *Bemisia tabaci* and other Hemiptera (*Calocoris* spp.).

This reddening is observed chiefly on the leaves of the young stem.

III. The Acala variety is not suitable for humid soils, the plants being subject to physiological reddening and severe infestation of *Empoasca*, with reddening in corresponding patches. In such an environment, the Stoneville variety is better adapted and even more so the Biancorizzo and Biancavilla varieties which have a greater resistance to reddening and *Empoasca*. For its qualities of adaptation, earliness, resistance to parasites, I consider that the Biancavilla cotton should not only be maintained pure but also improved by selection and hybridization, until a variety is created which meets Italian conditions better. In my opinion, the disappearence of this variety would be a great mistake.

IV. The chief problems in Italian cotton-growing are:—

(*a*) Obtaining of early varieties, adapted to our ecological conditions, with fibre having the qualities required by the cotton industry; (*b*) cultivation technique; (*c*) control of parasites which affect yield appreciably. In consequence of the direct or indirect damage caused by insects, the Italian cotton production is reduced by 30 to 50 per cent. and even more in some zones. Calculating the value of raw cotton at 500 lire per quintal, the loss caused by insects would be approximately 40 million lire (1/3 of the crop).

V. The cultivation technique today in the different cotton-growing regions is, in most cases, not rational, thus lowering greatly the unit yield.

VI. With an appropriate cultivation technique, namely, thorough preparatory working of the soil, careful breaking up of the soil and weeding, choice of seed (from the first crop), windbreaks (in windy zones), thinning out, topping as well as by a timely and rapid control of parasites, cotton-growing could assert itself in many parts of Sicily and the different littoral zones of Southern Italy (Calabria – particularly the Ionian zone – Lucania, Apulia, Campania), even after the war as proved by the yields obtained of 18 to 20 quintals (and up to 28 quintals in Sicily) raw cotton per hectare and this with great agricultural, economic and social advantages. In this way, with the splitting up of the Sicilian

latifundia into farms, the cultivation of cotton would have the great advantage of spreading out the working days of the peasants in fact, cotton requires, because of its biological cycle, attention during the summer (summer weeding), namely, during the period when all work for ordinary herbaceous crops, such as beans, wheat, forage plants, is finished.

VII. I consider the establishment of demonstration fields in each province of the cotton-growing regions advantageous. They should be entrusted to technicians really competent and keen on cotton cultivation and the land. These fields will enable farmers to see for themselves (from sowing to harvesting) that in suitable zones, cotton cultivated in accordance with a proper technique and the timely use of control measures against parasites, is an ameliorative and profitable crop.

VIII. Control measures.

The following are the measures to be adopted:–

(1) For insects with a buccal sucking apparatus (aphids, *Empoasca*, *Bemisia*), sprays containing nicotine (nicotine sulphate, ' Monital ') or dusts of crude sulphur mixed with 5 per cent. pyrethrum or rotenon powder should be employed. The treatments should be carried out opportunely under the supervision of an entomologist. Control operations, as regards application, should be organized by the provincial textile branches in collaboration with the Royal Phytopathological Observatories.

(2) For the control of the pink bollworm (*Platyedra*), the farmers will have to be constrained by Ministerial Decree to collect contemporarily the healthy and the infested bolls; the latter to be burned or consigned to the Cotton Pool to be disinfected. The Textile Branches should pay a good price in order to induce the growers to take a proper interest in harvesting as, in general, they are unwilling to follow this useful practice because they are unaware of the harm they do to themselves in leaving infested bolls on the field. Without careful collecting of the infested bolls, the disinfection of the seed at the gin-house is useless. In fact, it has been observed that cottonseed (from zones infested by *Platyedra*) from the pool warehouses and intended for sowing are infested to the extent of 5-10 ‰. The fitting up of warehouse windows with wire netting should also be made compulsory.

(3) For the control of *Earias insulana*, it is necessary to top the stems the moment they begin to wilt in consequence of caterpillar attack, and the infested flowers and bolls collected. Bolls infested by the caterpillar of the *Heliothis* should also be gathered.

(4) As regards the control of *Agriotes lineatus*, further experiments with poisoned seed bait and insecticidal substances are necessary. These experiments will be carried out in the field during the current year.

SWITZERLAND.

Progress of the Colorado Beetle, *Leptinotarsa decemlineata*, in the Country *

Situation on July, 1942.

During the month of June, 1942, the Colorado beetle invasion acquired considerable proportions. Favoured by warm and sunny weather broken by a few stormy periods, the insects developed appreciably and were found in practically all the regions of French Swirzerland and the greater part of German Switzerland.

The extent of the spread of this pest can be seen from the observations made and reports received from the cantonal commissaries of French Switzerland.

At Genève all the communes are more or less contaminated, but always the communes of the right bank of the lake and the Rhone and between the Rhone and the Arve are the most infested. Compared with previous years, the invasion is much more intense; in some parts plants were seen bent under the weight of larvae. The invasion, however, is very widespread and larval foci can no longer be distinguished.

In the Vaud canton, the reports of discovery of Colorado beetles, retarded by farm work, arrived in large numbers during the second fortnight of June, particularly after the compulsory visits to the fields by school children. At present 216 communes have reported discoveries, as against 128 on July 2, 1941. The zones of severe infestation are, as in every year, the Pied du Jura, the Orbe Plain, middle and lower Broye, part of the Avenches district and the Rhone Plain. The strong storm winds which blew between June 22 and 25 again brought quantities of insects from France along the Jura and chiefly in the Joux Valley.

At Fribourg, the weekly reports well show the progressive spread of the insect, which increased from 232 foci in 14 communes on June 3 to 2271 foci in 74 communes on July 1. All the districts are more or less contaminated, but the points most attacked are the communes of Cheyres and Dompierre in the Broye, Ried and Chiètres towards the lake and Boesingen in the Singine district. Among the more outlying localities where foci were reported, particular mention should be made of Granvillard and Albeuve above Gruyère, Bellegarde at the bottom of the Jogne Valley and Attalens near Châtel-Saint-Denis.

In the canton of Neuchâtel, 46 communes have been reported as attacked. In the Bas region, only the commune of Cortaillod has widespread infestation, the others are still able to control the foci; but these are considerable around Bevaix, Cressier, Boudry and Bôle. The Val de Travers is completely infested, especially at Saint Sulpice and Verrières; in the Val de Ruz, the Dombresson region is the most attacked. The districts of Haut, Chaux-de-Fonds and Le Locle only mention a few isolated foci.

* Comunication from the Federal Experiment and Seed-testing Station, Lausanne (Mont Calme), Switzerland.

In the Bernese Jura, on July 1, 82 communes were reported affected. The invasion is particularly severe in the Delemont district, in the plain and in the environs of Porrentruy.

Finally, at Valais, up to June 30, 117 foci in 14 communes were reported. Most of the communes attacked are in the Rhone Plain, in the districts of Monthey and Saint Maurice; however, a focus has been reported at Bramois above Sion, one at Sierre, one at Gampel and another at Rarogne. Following the discovery of an adult female insect at Bovernier on the side of Valettes, scouting was ordered in the valley between Martigny and Sembrancher, but no other insect was found in this region. Another adult was discovered at Champery and scoutings are in course along the Val-d'Illiez.

* * *

It is seen from the above that the insect is very widespread a little everywhere and that, considering the area invaded, infestation appears to be more serious than in previous years. Despite this, the general impression is that the Colorado beetle invasion is less severe than previously. This is due in part to the fact that everyone hastens to report all appearances of the insect and that inspection is brisker; but chiefly because the invasion, particularly in the badly infested zones, is much more scattered, the adults and larvae generally being found dispersed over a wide area, isolated or in small groups on plants more or less distant from each other. It is thus rare, despite the severe invasion, to see fields heavily damaged by the Colorado beetle. Mainly the weakly, late plants, smaller than the others, are the most subject to attack by larvae, which the vigorously growing plants to a large extent escape.

Eggs and small larvae could already be found at the end of May, but egg-laying only increased at the beginning of June and the larvae only appeared in a large number towards the middle of the month. It seems that heavy rainstorms accompanied by hail in the middle of June, in some parts, destroyed many of the very small larvae, as certain fields where egg-laying was abundant, subsequently were not much infested. The heat, however, favoured the development of the larva as on June 18, we already found some larvae in the 4th stage, and at the end of the month adults, eggs and larvae of all ages could be seen on plants. At this period, many of the large larvae, which had escaped treatment, had already burrowed underground to change into nymphs.

School scoutings were organized in many regions from June 19 onwards; in some communes they will be continued up to July 10. These visits to potato fields by school children have been found to be more and more indispensable: they are the only means of discovering the Colorado beetles in every recess, releasing the too busy farmers for other work.

The first compulsory treatments were decreed at Genève from June 15, in the other cantons between June 22 and July 4. The first spraying should be finished somewhat everywhere. They were effected, as in 1941, in patches, namely within a radius of 15-20 m. about the foci, according to the evidence of the Colorado beetle Services; in badly infested regions, a general treatment had

to be carried out. Arsenic treatments have given excellent results. According to the stocks in hand, diplumbic arsenate or calcium arsenate was employed. It was only when the treatment of potato blight (*Phytophthora infestans*) coincided with that against the Colorado beetle that the combined treatment with Bordeaux mixture was applied. Non-toxic dusts are being increasingly used for small plots and gardens.

Although control operations were favoured by fine weather, many adult insects and numerous egg masses will have escaped the poison, and the larvae already in the ground will shortly give rise to new adults. Therefore, inspection of the fields will have to be continued and preparation made for the second treatments which will have to be carried out at the end of July or the beginning of August.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

French Africa. — By Decree of the Chief of the French State dated August 26, 1942, with a view to organizing in French Africa protection against locust invasion and the consequent danger of their swarming and migration towards the colonies of this and the bordering countries, a locust control Office, attached to the economics department, has been instituted within the High Commissionership of French Africa.

This Office comprises, besides a central bureau with headquarters at Dakar, inspection stations for outbreak centres.

The head of the locust control Office is designated by the High Commissioner of French Africa on the recommendation of the Committee for biological locust research. He is charged with assuring the working of the Office, he proposes all measures to be taken or instruction to be given as regards putting into operation or improving means of locust control. With a view to ensuring effectual collaboration with the organizations concerned of the department: technical branch of tropical agriculture and the science division and with the Committee for biological locust research, he may be sent yearly on mission to them by the High Commissioner of French Africa. The duties of the head of the locust control Office will, in general, come within the agricultural technical and scientific departments for the colonies. He is assisted by a deputy chosen from among the assistants or laboratory chiefs of the agricultural and scientific departments for the colonies. This deputy assures the working of the Office in the absence of his chief.

The inspection stations for outbreak centres are charged with the control of locusts by the destruction of swarms in formation in their breeding places. They also carry out all useful research and observations on the biology of locusts and on the means of controlling these insects, in conformity with the instructions given them by the head of the locust control Office. These stations are organized by Decree of the High Commissioner of French Africa, approved by the Secretary of State to the Colonies, after recommendation by the Committee

for biological locust research. The technical personnel of the stations is composed of specially trained officers. At each station there are a station chief and district chiefs.

All the local services: general administration, agriculture, animal husbandry, forestry, etc. continue to be charged with the observation, report and destruction of locust swarms threatening or directly attacking crops. (*Journal officiel de l'Etat français*, Vichy, 9 septembre 1942, LXXIVème année, n° 216, p. 3088).

Germany. — The Government General, which comprises the greater part of former Poland, having been recognized as territory with an autonomous customs régime, a Decree dated January 17, 1942 gives, *inter alia*, a list of the commodities the importation of which into the aforesaid territory is prohibited. This list contains, for phytosanitary reasons, also: (1) young trees and shrubs including cuttings, etc.; (2) rooted ornamental plants, including bulbs, rhizomes, etc.; (3) peas, haricot beans, lentils, vetches and beans. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1 September 1942, Bd. XIV. Nr. 4, S. 92-96).

⁂ A Circular of August 3, 1942 establishes that readily volatile nitriles are to be put on the same footing as readily volatile hydrocyanic acid compounds. Their use, therefore, is only authorized if the special provisions introduced on their account, for example, by the Decree of February 2, 1941 regarding the utilization of the preparation 'Tritox' [see this *Bulletin* 1941, No. 5, p. 95]. (*Ibid.*, S. 87).

⁂ A Circular dated August 17, 1942 authorizes the customs offices to allow, as a temporary measure for the duration of the hostilities, the importation of potatoes, without phytosanitary inspection for the presence of wart disease [*Synchytrium endobioticum*] and without the presentation of certificates of health and origin provided that the quantity does not exceed 2.5 kg., dispatched by post and sent as a present to a foreigner working in Germany. (*Ibid.*, S. 86).

Germany (Protectorate of Bohemia and Moravia). — Ministerial Notification No. 338 of March 21, 1942 contains the list of preparations intended for use in the control of plant diseases and pests which, by virtue of Decree No. 89 dated December 5, 1940 [see this *Bulletin* 1941, Nos. 7-8, p. 142] may be marketed without a special permit. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang September 1942, 22. Jahrg., Nr. 9, S. 62).

⁂ A Ministerial Notification of May 13, 1942 contains a list of the preparations authorized for the disinfection of cereal seed, made compulsory by Notification dated March 26, 1942 [see this *Bulletin* 1942, No. 10, p. 142]. (*Ibid.*).

⁂ The Ministerial Notification No. 496 of May 30, 1942 abrogating that dated September 2, 1941 [see this *Bulletin* 1942 No. 4, p. 56] contains further

provisions regarding the chemical composition of certain preparations intended for use in plant protection. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. September 1942, Bd. XIV, Nr. 4, S. 99).

*** Ministerial Notification No. 300 (Chem. 55) of July 16, 1942 specifies that copper preparations containing less than 7 per cent. copper, are not subject to the provisions of the Ministerial Notification No. 233 (Chem. 33) dated January 6, 1942 [see this *Bullettin*, 1942, No. 4 p. 56]. (*Ibid.*).

*** Government Ordinance No. 292 of July 21, 1942 authorizes the proprietors and cultivators of land, as well as their representatives, to destroy sparrows (*Passer domesticus* and *P. montanus*) throughout the year, provided that the land in question is in direct communication with buildings and enclosed in some manner. (*Ibid.*, S. 98-99).

Belgium. — By Decree of August 21, 1942 every proprietor of elms giving visible or otherwise sufficiently known signs of attack by the Dutch elm disease (*Graphium ulmi*) is obliged, whatever the position, to fell or cause them to be felled and barked without delay and, at the latest, within fifteen days from the order which will be given him by the Forestry Service.

In default of these instructions being followed within the aforesaid period allowed, the administration of Woods and Forests will be justified in virtue of its office in proceeding to the execution of the measures contemplated and to the confiscation of the trees affected.

In the case of the proceeds of the sale of the diseased trees not being sufficient to cover the cost of felling, the proprietor will also be required to settle, within a month, the difference to the registrar at the public record and registry bureau. (*Moniteur belge*, Bruxelles, 27 septembre 1942, n° 270, p. 5896-5897).

France. — By Decree of August 20, 1942, the Laboratory of Faunology attached to the National School of Agriculture at Montpellier is qualified, from August 1, 1942, to determine the identification of plant samples taken under the conditions laid down by Decree of July 22, 1942 relative to the phytosanitary police powers of the officers of the Plant Protection Service. (*Journal officiel de l'Etat français*, Vichy, 9 octobre 1942, LXXIV^{ème} année, n° 242, p. 3421).

Italy. — A Ministerial Decree of September 25, 1942 authorizes the hunting and capture of the wild rabbit, declared a pest in the territory of Aosta Province. (*Gazzetta Ufficiale del Regno d'Italia*, Roma, 8 ottobre 1942, anno 83°, n. 237, p. 4168).

Portugal. — 'Portaria' No. 10: 068 dated April 14, 1942 specifies that the copper sulphate and other copper fungicides required for the treatment of vines in the Azores Archipelago will be delivered by the regulative Commission for chemical products to the agricultural associations of the municipalities concern-

ed, in the quantities determined by the national Wine Junta and in the manner established by 'Portaria' No. 10:054 [see this *Bulletin* 1942, No. 9, p. 124]. (*Diário do Govêrno*, Lisboa, 14 de abril de 1942, I Série, núm. 85, pag. [323]).

Switzerland. — Under the date September 23, 1942 have been published the instructions of the pharmaceutical and chemical products Branch of the War Office for the industry and work on the control of production of and trade in sulphur and carbon disulphide. (*Recueil des Lois fédérales*, Berne, 24 septembre 1942, n° 45, p. 892-894).

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INTERNATIONAL BULLETIN OF PLANT PROTECTION

DISCOVERIES AND CURRENT EVENTS *

HUNGARY.

Control of the Moroccan Locust during the Period 1938-1940 †

After a pause of ten years, the control of the Moroccan locust (*Dociostaurus maroccanus*) was again necessary in Hungary in 1938. A large number of hoppers appeared on the territory of the town of Nyiregyháza on a sheep grazing range measuring 280 cadastral arpents (1 cadastral arpent = 0.575465 ha.) utilized as ground for military practice. The local competent authorities having reported them too late, some of these hoppers had already spread to neighbouring grain fields. There is no doubt that this large number was the result of breeding for several years. A large swarm arrived from some unknown locality and multiplied over a period of three or four years. When reported on June 13, the insects were already at the end of the moulting periods and had already attained the adult stage. The danger could only be set aside by rapid intervention. Since June 16 ten machines of Hungarian manufacture for the destruction of hoppers have been at work and this pest was destroyed by ten days work carried out from early morning until late in the evening. The insects which were spread over the fields were driven off by 100 to 150 day-labourers provided with small black cloths onto the neighbouring grassland, onto the road and to the edge of the fields where previously a narrow border had been mowed; here the hoppers were crushed by the machines. The machines could be used successfully only on even surfaces, namely, on fields without plants of any great size. Where it was possible to push the insects into ditches, they were burnt with the aid of petrol-impregnated straw. Thanks to the immediate action taken, the damage caused to cultivated fields was but small and due solely to the unavoidable trampling of the ground.

The year 1939 well showed how effectively the control of the Moroccan locust was carried out, only a few large spots still remaining to be cleared up. The use of machinery was not even necessary. It sufficed to spread straw on the areas invaded and to burn the insects collected there; it was possible to finish operations in a day.

* Under this and the next heading the countries are arranged in French alphabetical order.

† Communication from Mr. SÁNDOR VITÉZ ANTALFY, Ministerial Consellor, Chief of the Phytopathological Section, Ministry of Agriculture, Budapest, Hungary.

On the other hand, the danger was all the greater, in 1939, in the Carpathian region freed two months earlier from Czech occupation, where an enormous number of hoppers appeared on the territory of the commune of Barkaszó in a large meadow of approximately 1500 cadastral arpents and in the nearby fields measuring about 200 cadastral arpents. This appearance was also the result of breeding over several years. Already during the previous years the peasants had notified the Czechoslovakian Government of this mass increase, but no control measures had been taken.

When the farmers reported the matter to the Hungarian Ministry of Agriculture on June 21, part of the insects had already reached the wing stage. Dr Gyula Kadocsa, Director General, accompanied by three assistants and delegated by the Royal Hungarian Institute for Plant Hygiene, went to the scene of infestation and began operations in the early morning of June 24 utilizing ten machines; 150 to 200 workmen chased the insects from the cultivated fields towards suitable areas where they could be destroyed by the machines or else burnt with straw. At first, operations continued throughout the day but after a short while all the insects attained the wing stage, and operations had to be limited to a few hours in the morning and evening as, during the day, the frightened insects flew further away. Operations lasted 15 days during which the insects were progressively destroyed. Owing to the delay in reporting the matter only the hoppers which had already penetrated into the cultivated fields caused damage and chiefly to still green oats and young clover. As regards other crops such as, for example, wheat, rye, and maize, the damage was insignificant.

In view of the fact that locusts had evidently crossed over into other communes and laid eggs on grassland, in 1940, every precaution was taken and the closest control exercized. About May 20, the eggs which had wintered in the soil began to hatch. Hatching was observed everywhere in the elevated regions. On June 5 operations began with the use of twelve machines. These were carried out under the supervision of the Royal Hungarian Institute for Plant Hygiene over a total area of 2010 cadastral arpents of communal grassland pertaining to the following six communes: Barkaszó, Csongor, Rafajna-Ujfalu, Szernye, Gorond and Izsnyéte. Control measures were only effected on the parts invaded which had previously been carefully kept under supervision and that even before the insects had spread. In this way, not only the area treated and the expense were less, but the danger of hoppers dispersing into neighbouring cultivated fields was avoided. Unfavourable weather conditions (continual rains) checked operations considerably; however, the infested areas were cleared up by July 9 and not an ear of grain was lost.

The very successful results have again demonstrated how well the Hungarian locust control methods fulfil the purpose. An essential condition for success, however, is that the appearance of the insects is reported in time. When these are in the larval stage on grassland and not yet spread to cultivated fields, destruction by means of the Hungarian machine is rapid and easy. These machines are constructed according to the plan of József Jablonowski, former director of the Entomological Station of Budapest. They are constituted essentially of large steel brushes attached to a framework drawn by horses and which

crush the hoppers on the ground. Ten machines work in one squad, each after the other, distanced half the width of a machine.

The infested areas are treated from the outside towards the inside, and then in the middle. The Hungarian State has 500 of these machines available, so that control operations can be executed in different localities at the same time. According to Law XXXI of 1907 and the provisions for its application, control operations are carried out by the authorities under the supervision of the competent personnel of the State. The only task of the local authorities is to keep watch over the grasslands and meadows in spring and to report any eventual invasion opportunely. In the case of farmers not recognizing these insects warning arrives too late, the State causes each year, the localities propicious for the breeding of hoppers to be supervised by officers of the Plant Protection Service so that the central department is permanently conversant with the position and can thus take, in due time, the necessary measures for any eventual control action.

ITALY.

Control of the Olive Fly by the Protection Method *

As is known, the problem of the control of the olive fly (*Dacus oleae*) is of considerable importance for the agricultural economy and autarchy of Italy. It suffices to record that this fly destroys every year approximately half the olive oil production of the country to a value (pre-war) of nearly half a milliard lire. Moreover, under present circumstances, the problem is of fundamental importance as regards fat supplies.

Unfortunately, up to date, no insecticide has proved really effective in the control of this insect. Despite the poor results obtained, however, research and experimental work must be continued in the hope of eventually finding a truly effectual and economic means of control. It is also advisable to continue studies on the parasites of *Dacus* in other countries begun and conducted with faith and enthusiasm by F. Silvestri.

In consideration of the present state of the artificial control of the olive fly, I began in 1937 [1] at Portici, in the Province of Naples, experiments with the protection method. This method consists in treating olive trees with substances which repulse the flies seeking a place to lay their eggs, and thus prevents the fruit being damaged.

Experiments with this system were continued in subsequent years (1938-41) in the commune of Villa Volturno and were carried out by the Olive-growing Branch of the former provincial farmers consortium under the supervision of the Laboratory of Agricultural Entomology of Portici. The results from the viewpoint of infestation, development of the olive trees and qualitative characteristics of the oil were good.

* Communication from Prof. GIUSEPPE RUSSO, Director of the University Institute of Agricultural Entomology and Director of the Phytopathological Observatory (Entomology Branch), Pisa, Italy.

The control method consists in spraying the plants with the following mixture:—

Water	100
Soft soap	1
Rich clay	3-5
Calcium polysulphide	3-5

Immediately after spraying, the plants are dusted with crude sulphur which adheres to the sprayed liquid; the whole forms a thin porous layer on the surface of the olives which are protected against insect punctures. Three treatments are given: the first during the first fortnight of July, the second in the third decade of August and the first decade of September, and the third in October, if possible after the first autunnal rains.

This method of control, which will be replaced by another system really effective, more simple and more economic, and which we trust will soon be found, has the advantage of not necessitating the immediate and general spraying of entire olive-growing zones, as is the case when spraying with molasses; in fact, isolated plants can also be treated.

Moreover, the raw materials cost little and in smallholdings, in the métayage system, the labour is supplied by the peasant himself, proprietor, renter or métayer.

This method makes it possible to obtain table olives free from worms and augments our industry, which is important seeing that our production is insufficient to meet the national demand.

The difficulty of this method, under present circumstances, is that of soap, seeing that the role of the latter is to facilitate the adhesion of the mixture to the olives. Other adhesive substances could be found.

It is well to apply this method where circumstances permit, because it would contribute to self-sufficiency in fats.

It will also be useful in controlling indirectly the olive moth (*Prays oleellus*) in the second and third generation. Studies will be made of the question.

Control experiments with the protection method will be continued with a view to rendering it more simple and economic.

Bibliographical references. — [1] RUSSO, GIUSEPPE. Primi esperimenti di un nuovo metodo di lotta contro la mosca delle olive. *L'Olivicoltore*, Roma, 1937, anno XIV, n. 11, pagg. [11]-12, 1 fig. Esperimenti di lotta antidacica col metodo protettivo. *Ibid.*, 1939, anno XVI, n. 4, pagg. [7]-8, 3 fig.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — A Decree of June 2, 1942 also extends to the district of Galicia the application of the measures relative to the control of fruit crop diseases and pests, measures introduced on June 28, 1941 into the territory of the Government General [see this *Bulletin* 1941, No. 11, p. 205]. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang August 1942, 22. Jahrg., Nr. 8, S. 54).

*** The regulations aiming at preventing mishaps caused by the use of arsenical preparations, drawn up by the Health Office of the Reich and the Reich Biological Institute for Agriculture and Forestry, were published on July 15, 1942.

As a general rule, it is laid down that the arsenicals employed in spraying and dusting should be considered as highly poisonous for both man and beast. The utilization of arsenical compounds or of preparations containing such compounds in wine-growing is prohibited.

The following precautions should be conscientiously observed:—

(1) Arsenical preparations as well as all apparatus or utensils adopted for their use should be stored in locked premises which cannot be utilized for keeping food, forage, beverages, clothing, bedding etc.

(2) The use of arsenical preparations should only be entrusted to adults, reliable and especially instructed in the precautionary measures to be taken.

(3) Touching the preparations in question with the fingers and stirring them up is to be avoided.

(4) The packing material must be destroyed by fire or removed in some other way without incurring any risk. In getting rid of any eventual residue of mixtures, care must be taken not to poison fruits, watering-places, streams, etc.

(5) The operators should be provided with special clothing, glasses and apparatus protecting the eyes and mouth.

(6) Each operator should have sufficient water available to ensure a thorough cleaning.

(7) Spraying and dusting operations should not be carried out against the wind in order to prevent the substance coming into contact with the workmen.

(8) No smoking or eating during work! Before eating, carefully wash the hands and rinse the mouth.

(9) The operators should be repeatedly warned to prevent them touching the spray nozzles with the mouth [to clear them by blowing through].

(10) It is prohibited to treat with arsenicals:—

(*a*) crops in flower;

(*b*) fruit crops (pip-and stone-fruits) when the fruits are in an advanced stage of development;

(*c*) berry crops before harvesting the fruit;

(*d*) vegetables, exception being made for those crops grown for seed.

(11) The use of arsenical preparations should be avoided when between or under the plants to be treated, there are vegetables or other plants the fruits of which have to be harvested within a period of less than six weeks after treatment.

(12) Treatment with arsenical products of crops growing near bee-hives during the hours when the bees are on the wing and without having previously notified the beekeeper is prohibited.

(13) See a doctor as soon as any symptom, even slight, of poisoning is felt. (*Ibid.*).

*** This year the fields are badly infested with wild radish (*Raphanus raphanistrum*] and with mustard [*Brassica sinapistrum*] and consequently an abundant seed harvest is anticipated. Trade in these seeds is blocked by virtue of the Decree of September 7, 1939. The seeds of these two weeds are to be utilized for oil extraction, any other use being prohibited. (*Ibid.*, Anfang September 1942, Nr. 9, S. 62).

*** A Decree dated August 14, 1942 modifies the provisions regulating the use of the preparation ' Tritox ' [trichloracetonitrile]. The administrative authorities are empowered to accede or not to the requests regarding the authorization to employ this preparation, without, in general, having to recur to a decision of the Minister of Agriculture. (*Ibid.*, Oktober 1942, Nr. 10, S. 68).

*** A Decree dated September 10, 1942 regarding the territory of occupied Luxemburg, enforces the police ordinances of January 11, 1938 and February 13, 1940 relative to the trade in and sale of toxic preparations [see this *Bulletin* 1938, No. 4, p. 78 and 1940, No. 6, p. 121]. (*Ibid.*).

Germany (Sudeten Territory). — By Decree of July 14, 1942 relative to the control of hop mildew [*Pseudoperonospora humuli*], it is prohibited, in certain communes where hops are grown, to let hop shoots lie along the ground; they should, in fact, as soon as possible, be drawn up to a height of at least 4 metres from the ground. At the most, three shoots per plant can be kept as reserve stock. These shoots when no longer found necessary should be removed.

Infected shoots should immediately be broken off or cut and subsequently burnt.

The hop-fields should be treated at least three times a year with copper washes or else by some other control measure recognized as being effectual by the Plant Protection Service.

Those parts of the plants left in the hop-field after harvesting the hops should be removed before the leaves yellow. If not required for any usage, they must be destroyed, at the latest, four weeks after harvesting. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. September 1942, Bd. XIV, Nr. 4, S. 89-90).

Italy. — Ministerial Circular No. 31 of August 10, 1942 modifies the Ministerial Circular No. 269 dated April 7, 1942 [see this *Bulletin* 1942, No. 9, p. 122] regulating the distribution of chemical fertilizers and fungicides. (*Bollettino Ufficiale del Ministero dell'Agricoltura e delle Foreste*, Roma, 21 settembre-1° ottobre 1942, anno XIV, n. 27-28, pp. 1679-1680).

*** Ministerial Circular No. 47 dated August 31, 1942 prohibits the use of poison bait composed of zinc phosphide, copper acetoarsenite (Paris green) and sodium arsenites in game preserves. (*Ibid.*, p. 1695).

*** A Ministerial Decree of October 28, 1942 renders compulsory the disinfection of nursery products (fruit and ornamental plants) pertaining to the Rosaceae, in the provinces of Piedmont, Liguria, Lombardy, Venetia, Tuscany, Emilia, Marche, Umbria and Latium. This disinfection should be effected normally by means of hydrocyanic acid gas in special fumigatoria.

Consignments of Rosaceous plants and parts of these plants from nurseries in the aforesaid provinces should be accompanied by a certificate guaranteeing that disinfection has been effected and issued by the Phytopathological Observatory of the region in question, or by other institutions deputed by the Observatory itself.

The directors of the Phytopathological Observatories have the faculty of granting an extension of time up to June 30, 1943 to nurserymen producing fruit and ornamental plants pertaining to the Rosaceous family, who have not constructed the necessary fumigatoria for the hydrocyanic acid gas disinfection of their products, or who have not proved by presentation of documents regarding the matter in question, to have provided for the construction of syndical fumigatoria, or to have the possibility of making use of existing installations.

During this period of extension, disinfection must be carried out according to the methods which will be prescribed by the Phytopathological Observatories.

No authorization can be granted for the establishment of nurseries or horticultural centres intended for the production, even partially, of Rosaceous fruit and ornamental plants, unless the applicants in question can prove the existence of effective disinfection establishments.

Disinfection expenses are charged entirely to the producer or grower of the plants and parts of plants subjected to treatment *

Morocco (French Zone). — By Dahir of June 16, 1942 (1 joumada II 1361) organizing the control of agricultural production, two departments are formed: the department of agricultural production and the department of forests, land conservation and cadastre. Among the duties of the first department are included plant protection and phytosanitary inspection. (*Bulletin Officiel*, Rabat, 7 août 1942, XXXIème année, nº 1554, pag. 662-664).

*** By Vizirial Decree dated July 7, 1942 (22 joumada II 1361) prescribing measures for the control of the pink bollworm (*Platyedra gossypiella*) and the spiny bollworm (*Earias insulana*) whosoever cultivates cotton, for whatever reason, is obliged to destroy all the stems, leaves, bolls, unharvested seed and, in a general way, all trash of these plants.

This destruction is to be effected by burning on the field itself grown to cotton; the transport of this plant trash away from the said field is prohibited.

* Communication from the Ministry of Agriculture and Forests, Rome, to the International Institute of Agriculture.

It is prohibited to carry away from land planted to cotton all the aforesaid plant debris, particularly plants, stems, leaves, bolls and unharvested seed.

The destruction of stems, leaves, uncollected bolls, etc. and, in general, all cotton plant trash, should be carried out immediately after harvesting, and at the latest, before February 1 after the harvest.

The Chief of the regional agricultural department can, in the case of unforeseen circumstances, waive this prescription without, however, allowing the destruction of cotton plan trash to be delayed beyond April 1.

Land having carried cotton should be ploughed to a depth of at least 15 cm. within a month after destroying cotton stalks and trash, ploughing to be effected after a fall of rain or irrigation.

This land should be kept in good condition during the following year and free from cotton ratoons and Malvaceous plants.

Every cotton-grower must deliver his entire crop, before March 15 of each year, to a ginnery approved by the Director of agricultural production.

The cotton should be ginned before April 1.

In the ginneries, the cotton debris and waste resulting from handling or ginning as well as the sweepings should be carefully collected and burnt the same day when produced.

It is prohibited to take away from the ginnery any cotton, waste and sweepings, but only baled ginned cotton and linters in bales.

Cotton seed intended for planting or any other use but the extraction of oil must be treated with heat; this operation should be realized immediately after ginning with an apparatus enabling the seed to be brought to a temperature of at least 55°C. for at least five minutes, and provided with an automatic temperature regulator as well as a daily recording thermometer.

The seed should be packed in sacks when taken from the apparatus and while still hot; the sacks should be closed and sealed without delay.

The seed for oil extraction should be packed in sealed sacks on egress from the gin; they should be kept in these sacks until the time of utilization and poured directly from the sacks into the crushers or oil extractors.

With the exception of treated seed, packed in sealed sacks, and compressed cotton or linters, the holding and transport of ginned cotton or linters not in compressed bales, of unginned cotton and untreated seed, are prohibited after April 15 of the year following harvesting.

The Vizirial Decree of October 16, 1939 (2 ramadam 1358) [see this *Bulletin*, 1940, No. 2, pp. 35-36] relative to the same question is repealed. (*Ibid.*, p. 666).

Switzerland. — The Plant Protection Branch of the Federal Experiment Institution for fruit cultivation, wine-growing and horticulture of Wädenswil has published the third supplement to the list of authorized preparations against plant diseases and pests for the year 1942 [see also this *Bulletin* 1942, No. 9, p. 125]. (*Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswil 1942, 51. Jahrg., Nr. 22, S. 433-434).

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Prof. Ugo Papi, *Segretario generale dell'Istituto, Direttore responsabile.*

STABILIMENTI TIPOGRAFICI CARLO COLOMBO — ROMA, 31 DICEMBRE 1942.